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Southern Medical Association, Thirtieth Annual Meeting, Baltimore, Maryland, November 17-20

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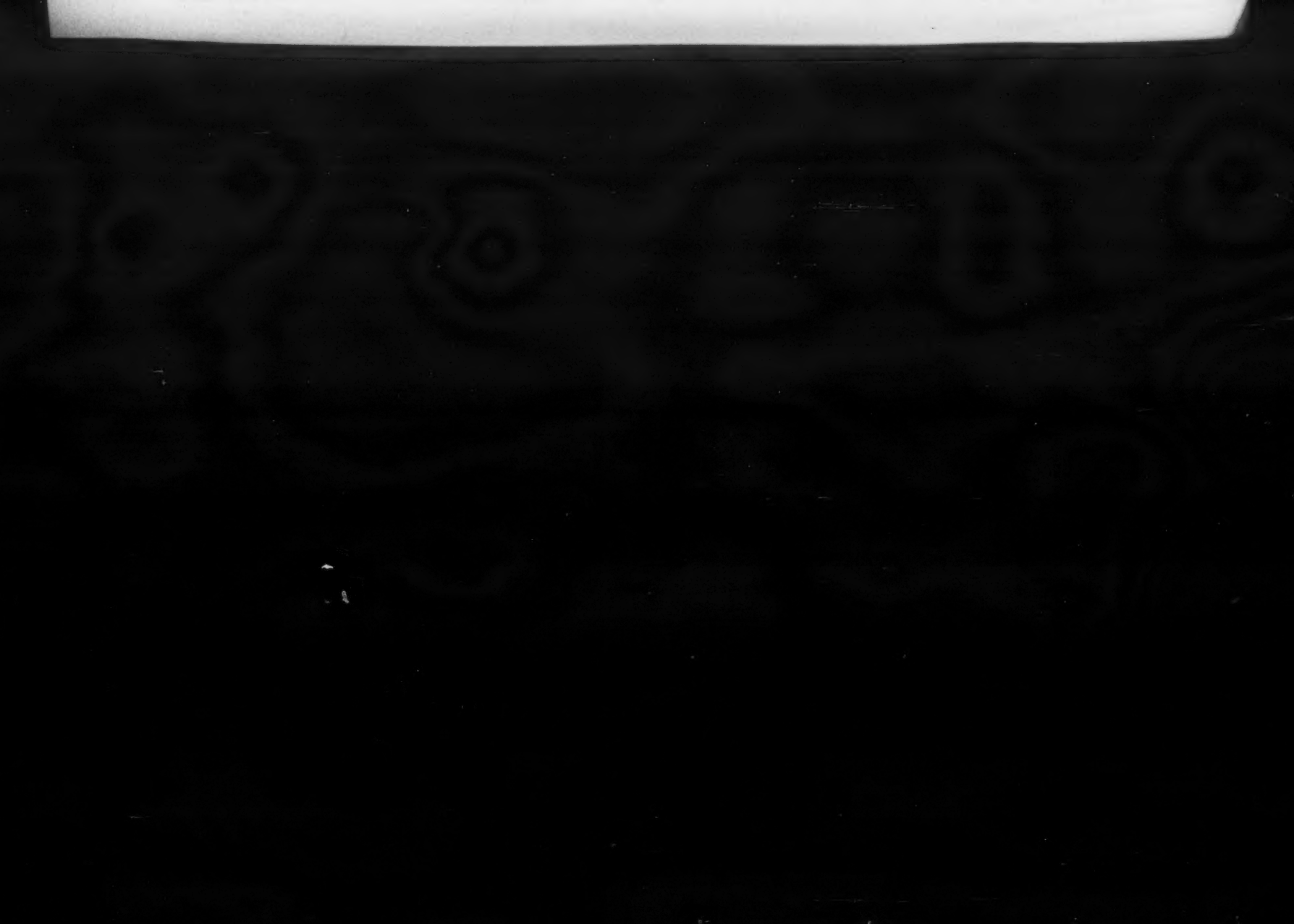

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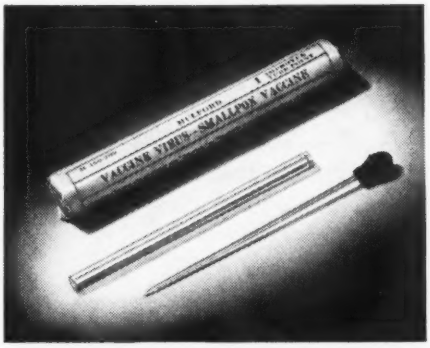

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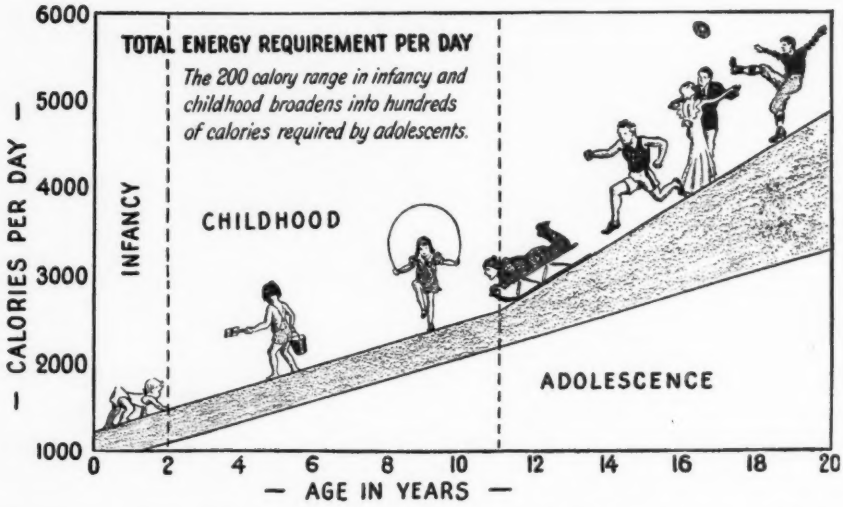

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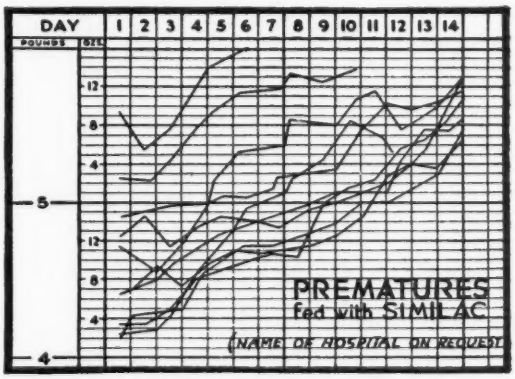

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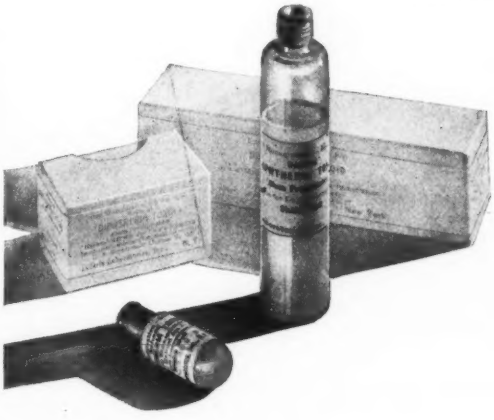

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* Martenstein, H.: Syphilis Treatment: Enquiry in Five Countries, *League of Nations Quart. Bull. Health Organ* 4:129, 1935.

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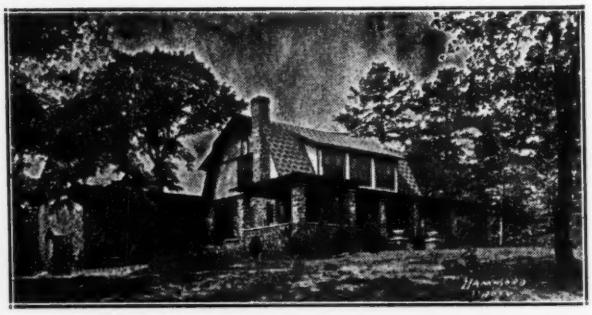

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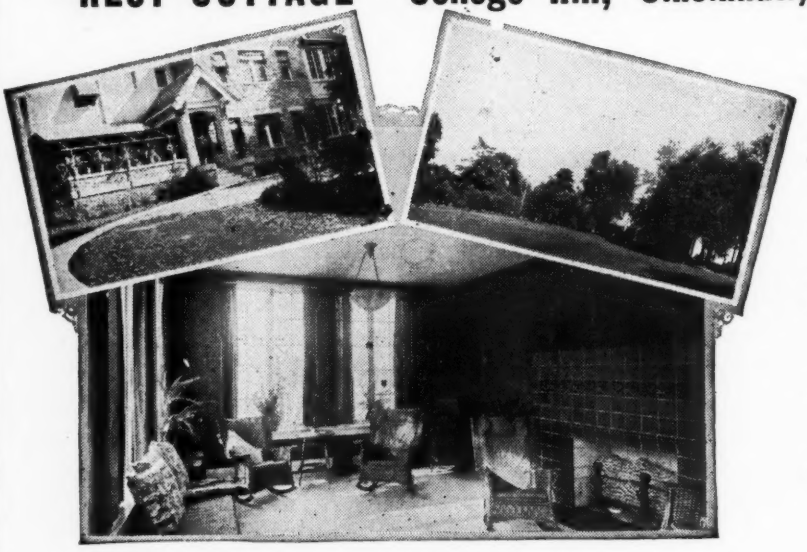

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THE OBJECTIVES OF MEDICAL EDUCATION*

By DEAN LEWIS, M.D.
Baltimore, Maryland

When I began the study of medicine revolutionary changes were occurring. The four-year course had been instituted by two medical schools, and the six-year course leading to two degrees was being considered by many others. Anatomy, physiology and pharmacology were beginning to be taught as sciences and the department manned by teachers without the degree of doctor of medicine. Ever since experimentation in medical education has been carried on, it has been in a state of flux. The objectives have varied from time to time and not infrequently we have hastened rather impetuously to new objectives before we have consolidated the lines which we have already taken.

Advances have been made, the number of medical schools has been drastically reduced, and medical instruction is better; but that entire satisfaction has not been attained is indicated by the number of discussions on medical education that appear on medical programs. Naturally I shall have in mind the surgeon when I am speaking of the objectives, but the surgeon should be an exceptional medical man who relies upon mechanical therapy. The objectives of modern clinical instruction should be to graduate a doctor who can diagnose a diseased condition, knows how to observe the course of disease and to determine when and at what point the disease is to be therapeutically attacked. To accomplish these objectives requires a considerable number of beds to provide for bedside teaching. Free beds are a *sine qua non* of good teaching, since the diagnostic examinations are no longer demonstrated, but the students learn these through their own efforts and must practice them until they can apply the methods themselves. All the opportunities for study may be offered, but the student must have talent, a liking for medicine, and industry. The importance of selection of the students will be discussed later. Some fifty years ago it was stated by the founder of one of the greatest schools of surgery that it was quite possible to learn all that was essential to surgical practice during the university course. The student of the present cannot learn all that is essential. He may learn methods and develop a system of thought and action which will stimulate him to continue work and build up a solid foundation. The broader and deeper the foundation, the higher he can build during the years of active medical work.

The curriculum has been changed from time to time, but I do not believe that these changes are vital. Some subjects develop interest and probably should be added to the curriculum, but the objection is always raised that the student already has to know too many things. If this is the case, subjects would be dropped which are relatively unimportant or have become so because of changes in diagnostic procedures or therapy. The faculty should determine in these cases the relative importance of the subjects. This probably would be difficult, for each department is apt to have an exalted idea of the importance of the subjects which it controls. This is merely human nature, and there is a good deal of human nature in all of us.

Anatomy is now taught in many schools as a science rather than as a subject which is closely related to surgery. No one can deny that the teaching of anatomy has improved since it has been regarded as a science. Its relation to surgery should be emphasized at some time during the medical course so that the student may learn the application of certain principles. The anatomic surgeon is disappearing, but at times I am almost persuaded to believe that resuscitation is at hand. The teaching of anatomy in its relation to surgery should be undertaken by the

*Read in Section on Medical Education, Southern Medical Association, Twenty-Ninth Annual Meeting, St. Louis, Missouri, November 19-22, 1935.

surgical department, preferably near the end of the second year. The anatomy involved in hernia might be discussed, linear guides to blood vessels and nerves shown, the capsule of the joints in relation to dislocations and the importance of the untorn portion of the capsule in manipulative reductions demonstrated. At this time muscle insertions might be reviewed, not with the idea of burdening the students' memories with disconnected facts, but with the idea of emphasizing the role which muscles may play in the displacement of the fragments of fractures.

The tendency of the last few years has been to advance clinical instruction into the first two years. Horder has recently said:

"The teaching of medicine differs fundamentally from the teaching of any other profession in this, that its success is entirely dependent upon close contact between the student and clinical material; that is, the patient. It was a dictum of the great French clinician, Trousseau, 'les malades, toujours les malades,' a dictum which might well be written up in large letters over the entrance to a medical school. That is another reason why the preclinical studies should not be too long drawn out. They are necessary, vitally necessary; but the sooner the embryo doctor comes in contact with the patient and keeps this contact, the better for both of them. Of course, the young doctor should have made contacts with his fellow beings long before this and should have trained himself to observe. The power of observation and an intense interest in human beings are much better indications that a boy will make a good doctor than finding him dissecting a fly or ill-treating a frog, which are the more traditional signs that he was destined for a career in medicine."

If the clinical work is advanced too far, it may be disadvantageous. The student's attention may be diverted from fundamentals which he surely needs. If neglected at the time, the results can never be retrieved.

The curriculum is usually laid out on a block system. This is extremely unfortunate, for the student may easily and soon develop the idea that the subjects are not related to each other and that preclinical work has no relation to the clinical. One of the important objectives is to make the student realize that each subject is related to the other and that when he enters the medical school all subjects contribute to the rounding out of his career. This is difficult, but we on the clinical side can contribute to it by using clinical material to illustrate the application of physiology, pathology and anatomy to clinical signs and symptoms. Infections may be discussed during the winter quarter of the second year. Charts may be shown to advantage to illustrate the fever curves associated with different infections. The relation of thrombophlebitis to infarction and chills and fever may be emphasized. It is frequently difficult for a student to understand fractures, to explain the different displacements which occur and what steps are necessary to replace fragments. The attachment of muscles and their action in the displacement of fragments may be studied to advantage at this time. Repair of tissues should be discussed at some length, for the student has recently completed histology or is studying it, and knowledge of it can be directly applied to study of the changes which occur in repair. Every effort should be made to demonstrate how the preclinical subjects bear on clinical problems. One of the most difficult things, as has been already said, is to show a relationship between the subjects of the clinical and preclinical branches and to do away with the idea of the block system of medical education. The realization of the principles of asepsis depends upon an intimate correlation between the department of bacteriology and the surgical clinic. Sometimes I believe that the changes in bacterial flora which take place under rubber gloves could be emphasized to advantage. If these changes were understood I am sure that many procedures now practiced would be abandoned. Shock, hemorrhage and fat embolism should be discussed while the student is still working in the laboratory or has but recently left it. From the day the student enters the portals of the medical school he should be made to realize that correlation of the different subjects and pursuit of knowledge must continue until the end of his professional career, and that while subjects may seem to be separate and distinct, they are definitely integrated, with at times some rhyme and reason, into a whole.

From the third year on the surgical department has the students under supervision at some time. The objectives of these years are to give the student an opportunity to see and learn to recognize disease, to know the clinical course and to know the underlying causes and pathology. Many innovations have been made during the past few years in clinical teaching. In some instances the third-year student has been placed in the wards and the fourth-year student in the dispensary. The dispensary is of special importance to the surgical clinic, for the majority of cases which will be later met with in medical practice could not be shown except in the dispensary, for patients suffering from these ailments do not enter the hospital except in the late stages when they are incapacitated. Pa-

tients do enter the hospital earlier than formerly, but not so early as they should, and this in spite of the propaganda which has been instituted in an attempt to persuade patients to seek early medical aid. One interested in surgery never tires of seeing cases. By seeing cases, making physical examinations and examining specimens, thus correlating clinical and pathological findings, one catalogues his mental impression and learns from careful observation to recognize the face of disease. In no way can one learn so much as by seeing cases; the larger his experience becomes the better. How much former experiences count in diagnosis is illustrated by a story told of Osler. One day he came into the ward and found some of his assistants gathered about a patient. They were engaged in a heated discussion, the diagnosis of the lesion exhibited by the patient being in dispute. An assistant asked Osler what the lesion might be and without hesitation he remarked: "That is a case of mycosis fungoides." An astonished assistant said: "How do you know it is?" and Osler replied: "I have seen a case before."

I believe that it is much better that the third-year student spend his time in the dispensary rather than in the wards. In most institutions the cases in which the diagnosis is difficult and considerable time is required in making examinations and tests are hospitalized. The simpler cases should be seen first and the difficult cases later, when the student has gained more experience and mastered many of the more difficult methods of examination.

During the third year interest in pathology should be maintained. In these courses the clinical and pathological findings should be correlated. Specimens of tumors may be examined in the gross. When x-ray pictures have been taken, the film should be carefully studied and then the histological preparation later reviewed. As the surgeon has a different approach to tumor pathology from that of the pathologist and can better correlate the findings, such a course should be given by the members of the surgical group. The main object of the operating room, so far as medical education is concerned, is that it acts as a laboratory which permits of the correlation of clinical and pathological findings.

During the fourth year the student should have charge of the patient, but under most careful supervision of the staff. Teaching of this kind places a responsibility upon the school, for with a class of 70 a school should command at least 100 free beds. I have heard it repeatedly said that private patients make good teaching material. They do for teaching of a certain kind, but this type of teaching has distinct limitations. The private patient, as a rule, is intelligent, gives a good history and is cooperative; but no private patient that I have seen would permit a student to see him daily. As has been said, a private patient is like a rare flower, or a costly jewel which can be seen once and returned to its case. The great trouble now is that, worthy as the objectives of medical schools are, the student rarely has an opportunity to watch a patient through the entire clinical course of the disease. The student would know more about infections, fractures and injuries of all kinds if he could follow the case from the beginning to the end, noting complications, method of repair, and so on. The independent work upon the ward must be supplemented by those responsible for teaching at the bedside. A well rounded picture of the disease must be given. I hope to see the day when such beds are under the control of the clinical departments, for the men in these departments know the material that should be presented. There are seasonal variations in material and relativity as regards importance, and those in charge of the teaching can regulate wisely admission of material for teaching purposes; for these reasons the clinician should have charge of admission. A relatively large endowment for beds will be required in a system of this kind.

Another objective should be to acquaint the student with medical history. This must be handled with care, for a touch of the pedantic may creep in unconsciously; but as I look back on my medical education it seems that some of the most stimulating and interesting things were a story relating to the life of a great clinician, the description of the development of an operation, or the application of some pathological principle to surgery. It should arouse the spirit of a student to know that a general practitioner in Connecticut described very clearly and succinctly congenital pyloric stenosis many years before Hirschsprung. To review Nicoladoni's article on "Dilatation of the Veins and Arteries of the Upper Extremity" and read his description of the bradycardiac reaction and the physiological work that he did in this connection makes the student realize how short-lived fame is, and how often in the preparation of an article we do not thoroughly review the literature. A great professor of pharmacology told me that he did not have a journal club, for if the student knew how much had already been

done he would be deterred from undertaking any work. It certainly would be of interest to the student to know that it is only about fifty years ago that Sir Victor Horsley first suggested that the symptoms of exophthalmic goiter were due to hyperactivity of the thyroid gland, and that some five years later the elder Rehn made the first planned attempt at removal of the gland with the idea of effecting a cure.

Such a procedure in surgical teaching must be undertaken only after deliberate consideration and with the greatest care. In an endeavor to arouse interest the student should not be burdened with names or historical facts, so that he is confused and depressed rather than stimulated. I sometimes think that the judgment required in making a decision as to this is so fine that it might be well not to attempt it.

It is sometimes said that the results of surgical teaching are not as good as those of medical teaching. One may not admit this, but it can be said without fear of contradiction that in surgery the lack of personal skill, failure to make rapid decision and inability to use the hand well are glaring faults. As a medical student I came in contact with three teachers of surgery, all greatly different. One was delighted with a large number of students and visiting doctors. The clinic was attended by from 350 to 400. I did not learn anything from the operations which were performed, many in an afternoon, but I did learn of Bassini and his work, of Ogston and Ollier, and of the technic of intestinal suture and the process of repair. This surgeon stimulated me to read and aroused an interest in the history of surgery. I am sure that I should never have been tempted by anything I witnessed, although this was largely an operative clinic, to begin operating without long preparation. Another surgeon, hesitant of speech, not a skillful operator, had a philosophical approach to surgery. He was a pathologist primarily, a surgeon secondarily; but he gave me my first knowledge of surgical literature, how it could be followed, and that there was great satisfaction in searching for and reading things, when possible, in the original. The third teacher was a brilliant diagnostician, who employed experimental methods in solving problems which he encountered in the clinic. At times there is a definite attempt to confine teachers to certain methods. The teacher should use the method most familiar to him and with which he gets the best results. But in none of the methods employed should "spoon feeding" be the foundation stone.

Probably the questions of operative surgery and technic will arouse the greatest amount of discussion. Operative surgery on the cadaver has gradually passed out of the picture of medical education in most institutions. Over a half century ago, as already stated, one of the greatest surgical teachers said that it was quite possible to learn all that was essential to surgical practice during the university course. This is no longer true, for the technical procedures have increased greatly in number and become more complicated. I believe that there are some operative procedures with which a student should be familiar, and naturally before he attempts any of these he should know the principles of asepsis, a knowledge of which is sometimes difficult to acquire. Sometimes this seems to be intuitive, for I have not infrequently seen men who were well grounded in pathology and diagnostic procedures who could never learn the principles governing aseptic surgery, and one could almost predict this to a certainty when they were seen entering the operating room. There are certain emergency operations which a student should know. I base this statement upon the review of sad experiences. The student should know how to suture a tendon and a nerve, how to ligate arteries in continuity, how to relieve an intestinal obstruction, and this may necessitate some knowledge of how to perform an intestinal anastomosis. This knowledge is fundamental, and I do not believe that with such a minimum a medical student will be greatly tempted to try operative procedures in more difficult fields. There is no necessity of burdening students with the technic of a number of operations. An opportunity must be had of an assistantship in a surgical clinic if the prospective surgeon is to become an operator. The students should learn when an operation is necessary. Only the simplest operative manipulations and the technic of emergency operations that must be done quickly to save life and those mentioned above need be discussed.

This is a rambling discussion, but I have attempted to point out that throughout the clinical years the objectives should be to give the student an opportunity to learn to know the face of disease and to recognize it as he would an old friend when he sees it. To be able to do this, he must have daily contacts with the sick: must know the underlying causes and correlate them with appearances of the patient. Even

when all the opportunities are given there will be many disappointments. Many of these will be due to the failure of the teacher to recognize the deficiencies and discouragements of the student. In a class of 70, for example, from 15 to 20 will need little, if any, guidance; they will work independently. About 10 will fail or never come up to expectation, when all the supervision and guidance possible are given. In the majority of instances these students will be recognized at the end of the first year, and out of a spirit of kindness I believe that these should be advised to enter some other field of activity. Many of the rest will be somewhat confused at the beginning. It may be some time before they see the application of the subjects which are being taught, and one of the main objectives of the medical course should be to guide the members of this group, for from them will develop some of the best practitioners of medicine.

Research is a by-product of medical education. In these days some measure of discipline should be insisted upon. There is a tendency for a student to neglect a subject that is difficult for him. At times he is encouraged in this by his instructor. Such an attitude seriously weakens the morale. The idea that a student is doing research does not justify him in neglecting his regular work unless the results of his research outweigh in importance the good he would receive from pursuing the prescribed course, and this is rarely the case.

DISCUSSION (*Abstract*)

Dr. Noble P. Sherwood, Lawrence, Kan.—While it is perhaps true, as Dr. Graham has just said, that Dean Lewis has limited his discussion of the problems in medical education largely to the technic of teaching surgery, yet in this paper he calls attention to a number of fundamental facts about medical education. He points out the necessity of employing scholarly, enthusiastic teachers deeply interested not only in their patients and their particular subject, but also in the student and his task of mastering the subject. If the clinical faculty and the student, as well as the pre-medical and pre-clinical faculties, could be made to appreciate and wax enthusiastic over the importance of the educational program leading up to the clinical years, I dare say we should be amazed at the improvement in the quality of physicians graduated. Every teacher who handles the student can no doubt improve his efficiency by acquiring an understanding of the objectives of medical education and by attempting not only to understand the problems of his colleagues, but to work in harmony with them. By inference I judge from Dean Lewis' remarks that he is intensely interested in teaching the art of medicine as well as its science. May I suggest that the dispensary can be used to a better advantage in this respect?

THE FUNCTIONAL VIEWPOINT IN THE MEDICAL SCIENCES*

By GEO. T. CALDWELL, M.D.
Dallas, Texas

In spite of the rapid advancement of medical knowledge and the widespread improvement in medical practice, there is a prevalent dissatisfaction among the scientists in medicine and the best type of medical practitioners with the results obtained by their combined methods of approach in solving the problems of disease. Many of the expressed criticisms refer to the apparent lack of useful interrelationships between the fundamental science teachings and their adaptation by the clinician.

One special phase of this large problem is the outlook or point of view acquired by the student during his study of the medical sciences, and how this outlook or viewpoint affects his interests and enthusiasms and later his practice of medicine. For some years the functional viewpoint has been stressed as having merits not possessed by the older anatomic viewpoint in regard to disease.

Several exaggerated expressions dating back some years serve to emphasize this changed attitude. A distinguished clinician is quoted as having stated that what is wrong with American medicine is that the dead hand of Virchow still rests upon it. One of the most experienced surgeons in the world today is credited with having contrasted what he chose to call living pathology with that of the deadhouse and the morgue. Sir James Mackenzie[1] remarked that medicine has been taught for centuries and the teachers of today are directly descended from those of the Dark Ages, explaining that much more is required of the doctor than the detection of signs and symptoms, that to assess their value is by far the most important of the doctor's duties. Finally in a paper presented last year at San Antonio[2] the statement was made that medicine has been held back a hundred years by the present anatomic outlook, a statement which is difficult to harmonize with the fact that most of the great strides in scientific medicine have been made within the last century, unless it is prophetic of future stagnation.

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*Chairman's Address, Section on Medical Education, Southern Medical Association, Twenty-Ninth Annual Meeting, St. Louis, Missouri, November 19-22, 1935.

Although the foregoing statements were made chiefly for the sake of emphasis, no one will doubt that they contain a disturbing element of truth. What, then, is this pernicious anatomic outlook? And what are the advantages possessed by the functional viewpoint?

There is no doubt that the medical sciences are the outgrowth of clinical medicine, and must for the present be intimately associated therewith. Their fields are coextensive in so far as they attempt to understand disease and to promote health. As Corcoran[3] has recently expressed it, "Medicine must now always be considered the application of the scientific method to the problems of health and disease," or as stated in the recent Report of the Commission on Medical Education (1932):

"The purposes of the medical course are to familiarize the student with the structure, function and behavior of the human organism as a whole in health and disease."

THE STRUCTURAL OR ANATOMICAL VIEWPOINT

Clinical medicine began its development as a descriptive science. The observational method utilized chiefly symptoms and signs as the manifestations of disease, and out of these constructed the syndromes of many of the more common human diseases, thus furnishing a means for their identification. Such observations with their detailed descriptions have been a most fruitful method for the study of disease even in recent times. However, it is apparent that these descriptions of symptoms and signs often left their interpretation in doubt, or led to erroneous conclusions. Furthermore, as Mackenzie[1] has pointed out, symptoms and signs are so numerous, so varied, so confusing, that generalizations, interpretations and explanations become essential to bring this great volume of observations within the range of the human intellect, and as noted by Sir Thomas Lewis,[4] the observational method through mere exhaustion must become less prolific. Such observations, detailed and accurate as they were, and important as they must necessarily be, in any complete understanding of human diseases, failed to furnish the materials necessary for interpretation and left the elements of mystery and imagination enthroned in clinical medicine.

It must not be understood that these clinical observers failed to note structural changes produced by diseases. These abnormalities, deformities and irregularities must have excited the curiosity and engaged the attention of the very earliest practitioners of medicine, even before any very accurate knowledge of the normal anatomic structure had been acquired, the departures from normal structure served to direct attention to the normal.

The advancement of the knowledge of morbid anatomy, at first, was necessarily slow in human diseases, because of formidable opposition to dissections of the body after death. However, these early beginnings stimulated the study of normal structure which required only relatively few bodies, and the gross structural make-up of the normal human body became fairly well known. As the restrictions upon the dead were relaxed, gross pathology made rapid strides, and morbid anatomy became the basis for a renewed interest in disease, and led to a new series of observations and descriptions of the changes which it produces. These concrete findings tended to dispel the notions of spirits and of humors, as causes of disease, and presented another aspect to be harmonized with the symptoms and signs produced. The changing attitude was expressed by Morgagni[5] when he said:

"Those who have dissected or inspected many bodies have at least learned to doubt, when others who are ignorant of anatomy and do not take the trouble to attend to it are in no doubt at all."

The introduction of the microscope into biology, revealing some of the finer details of plant and animal structure, gave a forceful impetus to the study of the structural changes produced by disease, and through the powerful influence of Virchow, and subsequently by a host of other workers in this new field, established the cell as the structural unit of body tissues and cell injury as the structural basis of disease. Observations could now be made more accurately than heretofore, and entirely new descriptions of the lesions produced in the body soon became available. No intimation is justified which would detract in any way from the appreciation of the great advance in the understanding of disease engendered by the aid of anatomy in its larger sense. As has been stated by McIntosh,[6] it established a hope of explaining disease and symptomatology through a knowledge of the accompanying morphologic changes, and spurred on the study of clinical medicine in that it facilitated the segregation and identification of disease pictures along anatomic lines, but, in a sense, it was merely an elaboration of descriptive medicine, and was destined eventually to become only one phase

of the search for a linkage between symptomatology and etiology.

The dominance of the cellular pathology of Virchow was established for a long period by the fortunate discovery by means of microscopic methods of the etiologic agents responsible for many of the more common infectious diseases, and the hope became prevalent that all human diseases might be found to be of infectious origin, in which case the ultimate conquering of human disease would be in the offing. The yielding of many of the infectious diseases to preventive and curative methods constitutes the greatest accomplishment in the promotion of health and increase in the duration of life in all history. No other achievement comparable to this is recorded in the illustrious annals of medicine, and it seems doubtful that any equal accomplishment will ever be attained. This by-product of the anatomic method has completely justified the method for all time.

What, then, are the shortcomings of the anatomic viewpoint in medicine? McIntosh[6] has attempted to point out some of the limitations:

"In the first place, it has over-emphasized the end-stages of disease rather than the earliest stages, a natural consequence of the autopsy method of approach. Secondly, the anatomic studies alone contributed relatively little to the knowledge of the causes and of the exact mechanisms of the production of the lesions. In addition, the findings often failed to explain satisfactorily the symptoms and signs presented during life and numerous clinical entities have failed to show anatomic changes to account for the symptoms presented."

To these should be added that dead tissues differ markedly from living tissues, and one would not expect to learn the secrets of life processes from the cadaver, or understand the working of cells separated from the fluids which they contain and in which they are bathed. The cell death and tissue destruction resulting from disease are the results of the disease and not the disease itself. The relationship of this destruction to the disease is like the waste produced by a hurricane after the winds have subsided, or the devastation wrought by an earthquake after the earth tremors have been quieted. On the other hand, anatomy lends itself to objective demonstration and is tangible. When accurately observed it becomes self-evident, and is easily confirmed by the observations of others. The technic used for its study requires no complicated procedures, no abstruse formulae, and is remarkably free of faulty interpretation. In historic sequence, it is apparent that the knowledge of structural changes should accompany or follow in order the description and elaboration of clinical symptoms.

How, then, does the functional or physiological viewpoint differ from the morphological or anatomical point of view? Primarily, physiology deals with the normal working or functioning of the various component parts of the body, with the interrelationships between the various organs, and ultimately with bodily activity as a whole. Physiology began its development with clinical medicine. Galen, a clinician, is accredited with having observed that the arteries contain blood during life, although it was fourteen centuries later that Harvey, another clinician, demonstrated the complete course which the blood follows in its circuit through the body and furnished an explanation of the circulation of the blood.

This fundamental discovery ranks as one of the most important of all time, both for an understanding of many of the bodily functions and also in the interpretation of many disease processes. No amount of morphological study of the vascular system could be expected to lead to correct or useful interpretations without the fundamental conception of the circulation of the blood. This far-reaching advance in physiology stimulated the idea of mechanisms in disease and as Magendie expressed it, pathology became the physiology of the sick man, and symptoms of disease gradually became recognized as manifestations of unusual or abnormal activity of a part or organ. By the application of the principles and the accurate measurements of physics and chemistry to biological problems it was thought for a time that mechanisms might be elaborated which would ultimately explain the phenomena of health and disease in man.

The functional viewpoint in medicine requires that the physician shall not think in terms of diseased structures alone, but also in terms of disordered physiology. Fortunately, alterations of normal activity are frequently accompanied by structural alterations in the tissues, so that pathologic physiology and pathologic anatomy often go hand in hand. Wells[7] has emphasized that the cell is not only the unit of all anatomical considerations of disease, but that in physiology the same unit has been found equally useful. The cell structure determines the environment of its chemical constituents; consequently all considerations of the chemistry of disease must refer back to the chemistry and physics of the nor-

mal cell, with physico-chemical processes playing an all-important part in the life phenomena of the cell, both under normal circumstances and in disease. This statement is intended to present the concept of the living cell in its environment, surrounded by and perpetually bathed by the sustaining tissue fluids which in turn are constantly altered by the free exchange with the circulating body fluids. Carrel[8] has emphasized that the laws of physics and of chemistry are identical in the world of living things and in that of inanimate matter, and that the physico-chemical aspects of human beings are about as easy to investigate as those of the other objects of the terrestial world, but that the study of what he calls the truly physiological phenomena, that is, of those resulting from the organization of living matter, meets with more important obstacles. He states that we do not possess any technic capable of penetrating the mysteries of the brain and of the harmonious association of its cells. The mind is hidden within the living matter, nearly completely neglected by physiologists, and insusceptible of approach by morphologists.

What, then, are some of the advantages possessed by the physiological or functional viewpoint in medicine?

The physiological method is essentially an experimental method, and as such, it is not subject to the same limitations of exhaustion which are inherent in the observational method utilized by structural or morphological studies alone. As long ago as 1907, Wells[9] remarked that pathologists have come to feel that the opportunity for the acquirement of knowledge by means of morphological studies has become reduced to a minimum, while the fields of pathologic physiology and chemistry lie almost unexplored. The quarter of a century which has elapsed since that time has borne abundant fruit, largely as a result of this changed emphasis in the approach to the problems of disease, as witnessed by the steadily increasing knowledge of the factors regulating growth and metabolism. This introduction of the accurate methods of biological chemistry and the careful measurements of physical chemistry into physiology and pathology has revealed the mechanisms of many of the bodily functions and established a scientific basis for the interpretation of many of the symptoms produced in disease. An accurate interpretation of these disturbed functions has not only added valuable material for use in diagnosis, but has also furnished new indications for treatment.

Meakins[10] is so enthusiastic about this advance that he states that this point of view which has led to the investigation of the abnormal physiological and biochemical processes in the living body has tended to raise clinical medicine to the status of a living biological science, since attention has been directed to the elucidation and significance of certain outstanding signs and symptoms of disease. On the other hand, Hamman[12] ardently supports the structural viewpoint in clinical medicine when he says that from the practical standpoint diagnosis leans more heavily upon anatomic change than upon change of function, and our studies of function serve chiefly to allow us to decide more accurately the character and the extent of structural changes. Likewise Blumer[11] states that the fields of pathology whose cultivation is most essential to the development of the clinician are morbid anatomy and histology, since a study of these subjects makes for precision in diagnosis. However, while this attitude may be largely justified in that part of clinical diagnosis which depends directly upon the symptoms and signs presented by the patient, it does not intimate that the information obtained by physical, chemical and physiological methods does not constitute a worthy search for etiology, or, at least, for fundamental mechanisms in disease. Krehl[13] remarked many years ago that controversies as to the proper point of view, whether functional, chemical or morphological, to be taken in the interpretation of the manifestations of disease are obviously barren, for these different aspects are closely bound together and for a final judgment of any disease process the problem must be viewed from every aspect.

> "There is but one correct way to study the majority of morbid processes and the functional disorders of the organs which produce them, and that is by a comprehensive comparison of physical and chemical anomalies in disease with conditions as we know them in health."

Since many life processes are of a physico-chemical nature, and since disturbances of these processes give rise to manifestations of disease, there can be no reasonable doubt that the introduction of the refined technics of physics and chemistry into the study of human disease has opened up new vistas comparable only to the great advance made in morphologic knowledge which resulted from the use of the

compound microscope in the study of normal and pathologic tissues. Furthermore, the knowledge thus obtained can be directly utilized in the interpretation of normal body processes, and furnishes the rudiments for a future understanding of health and the early departures therefrom. Instead, therefore, of emphasizing the results produced by disease, the physiologic outlook tends to stress its pathogenesis or its underlying mechanism and even the conditions classed as normal come within the range of its investigation. Health as well as disease promises to yield some of its intangible secrets to the combined attack of the physical, chemical and biological sciences. Burnet[14] expresses the opinion that medicine has, for a long time past, concentrated on the art of curing disease, and states that it is now time for it to devote its chief attention to the task of preserving, or even of creating health.

All present methods of approach, singly or combined, have failed to yield more than encouraging returns in the highly complicated field of mental diseases, and even normal mental processes have refused to reveal their fundamental mechanisms. In discussing the teaching of psychiatry, Ebaugh,[15] with some justice, laments that as a result of the overmechanization of the preclinical years, the student looks on psychiatry as a mysterious subject, something that is different, something that cannot be understood, and something that cannot be studied through a microscope and with instruments of precision. It may, indeed, be true that mechanistic interpretations based on inadequate data occasionally lead to faulty interpretations, and by their acceptance effectively block the way to progress along other lines of approach, and it may even be admitted that mental processes have resisted any adequate mechanization by the usual physiological methods; however, it must be recognized that morphology, on the one hand, and the mechanisms elaborated out of the data of physics, chemistry, biology and physiology on the other, constitute to date the most secure basis on which our scientific knowledge of disease rests. Mechanisms as well as structure doubtless have their limitations, and new methods of attack must be secured before ultimate explanations of mind and of life are laid bare. The experimental methods of the fundamental sciences offer the greatest hope at present for the development of new technics, and in the meantime continue to furnish explanations for some of life's grosser processes.

In summary, therefore, the functional viewpoint utilizes the data furnished by the fundamental sciences in an attempt to understand disease and health. It necessarily holds an intimate relationship to clinical medicine, since it is concerned with the interpretation of the manifestations of disease, and incidentally with the performance of normal bodily functions. Because of the intimate relationship between structure and function, morphological changes occurring spontaneously in disease or produced experimentally lose none of their significance, but fall into their appropriate place as the result of previous regulatory or functional processes, the production or causes of which must be interpreted. Emphasis is placed on causes, pathogenesis, or mechanisms, and, therefore, on early rather than late stages of disease. The physiological or functional viewpoint leads directly to a consideration of health in contrast to fully developed disease, and, as such, holds a close relationship to the preservation of health, and, in general, to preventive medicine. Not only so, but it carries with it the opportunity of making the growing knowledge of man, one of the most important, if not the most important, division of all human knowledge, a type of learning which some newly inspired university will recognize as infinitely superior to much of the medievalism on which valuable time is now wasted and inspiration wrecked.

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THE PRESENT STATUS OF PSYCHIATRY IN MEDICAL EDUCATION*

By FRANKLIN G. EBAUGH, M.D.
Denver, Colorado

In our 1931-1932 appraisal of the teaching of psychiatry it was found that 14 of the 68 schools visited were giving reasonably adequate instruction in psychiatry. From many points of view such an appraisal is discouraging and especially so when we realize that the main objective of a general medical education is to produce, on the completion of the medical course, a practitioner who has acquired a sound attitude toward his medical duties and responsibilities along with an ability to deal reasonably well in the early days of his practice with the rank and file of his patients: those presenting mental as well as physical phenomena. At the time we made the rounds of the medical schools there was an unanimity of opinion among the deans, professors of medicine, professors of pediatrics, and the psychiatric teaching personnel concerning the practical importance of psychiatry in medical education which has paved the way for progressive change in the teaching of psychiatry as a fundamental phase in the basic general training. These changes are shown in the following chart, which indicates that during the current teaching year there is evidence that all but 20 of the 68 schools visited have made noteworthy advances in the teaching of psychiatry. Such improvement, of course, is reflected in the teaching personnel, the content and viewpoints of teaching, and the clinical facilities available. Several schools have developed so-called liaison departments, where the mental phenomena encountered in out-patient medical clinics and medical wards are freely utilized for teaching. Many other schools continue to use state hospitals in their teaching and a few of these unfortunately continue with clinical teaching in the junior year class without establishing the essential preclinical foundations. The progress made was accelerated by the adoption of flexible Class A standards by the advisory committee of psychiatric education with their later endorsement by the American Psychiatric Association in 1933. These flexible standards for the teaching of psychiatry in Class A medical schools center around the following principles:

Psychiatry should be looked upon as one of the fundamentals of the basic training of every physician and should not be taught as a specialty, but should be a major division of the general medical curriculum, along with medicine, surgery, obstetrics and pediatrics. It is strongly recommended that psychiatry should have a place in both the preclinical and clinical teaching. During the preclinical years it is most important that the student should be given insight into the normal functioning of the individual as a person. This means that at the beginning of his medical training the student will have some practical and theoretical experience in personality function and management, which is given in some medical schools under the general heading of psychobiology and in others as medical psychology. Psychobiology means the study of the individual in action and this action is known as behavior. It concerns all these functions and performances which cannot properly be said to be the function of merely one or another part of the living organism, not even merely of the brain. Anyone will best understand it as the functioning of the individual, the person, the he, or she, not as a mere mind, but as a live entity with the flesh and bone of anatomy and physiology. This includes all that which has always been studied as psychology. Psychobiology is based on concrete work, on what the student has observed as happening in concrete personality studies and observations and doings of specific persons to be described and used in the terms which describe what we actually find and touch and see and see used. The person is a biological entity with a name and life history and inner continuity and actual record, an entity spread over a lifetime between conception and death and natural periods and phases and rhythms of action and rest, wakefulness and sleep, phases of maximal fitness and states of repair. Likewise a preclinical foundation should consist of work in psychopathology which, like the rest of pathology, is fundamental in the basic medical training. Here the main mental reactions should be discussed along with the methods of case study centering around the complaint, the indirect examination shown in the history, and the direct examination given in the physical and neurological examinations, study of the mental status, contributory examinations and formulation and treatment. In the study of the development of emotional life, the inter-

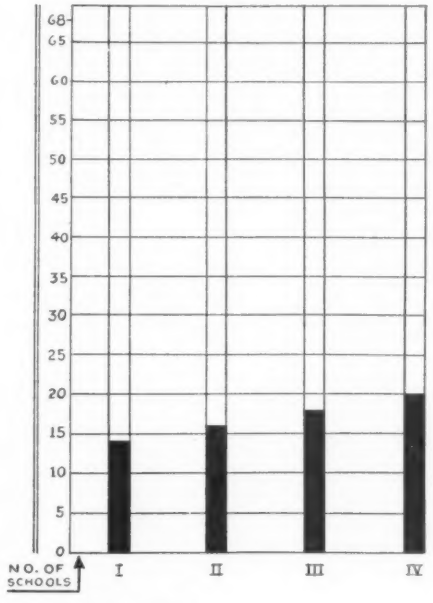
*Read in Section on Neurology and Psychiatry, Southern Medical Association, Twenty-Ninth Annual Meeting, St. Louis, Missouri, November 19-22, 1935.

action of personal, environmental and physical factors should be kept constantly in mind. The part the general environment has played in development of symptoms such as the role by the father and mother, older and younger children, the employer, the management and use of such mental mechanisms as identification, projection, introjection, punishment, compensation, and the like, the use of these by the child, their further use and elaboration by the adolescent, and the still further use and elaboration by the adult. In such teaching, in terms of psychobiological principles involved in personality study, the various reaction sets based on the interplay of physical, psychogenic, toxic and organic forces, and economic and social features can be evaluated as shown in our chart.

The general principles underlying clinical instruction are likewise flexible, depending on the existing facilities and local situations peculiar to each medical center. In the main, the clinical instruction should include provisions for practical work to supplement the didactic and preclinical instruction, using available ward and out-patient facilities and in some centers interdepartmental consultation services. It is anticipated that the bulk of this work may fall in the third year and that the fourth year will be devoted to the complete examinations and formulation of a reasonable number of cases with a minimum of six.

It is not felt that elaborate courses in clinical psychiatry, that is, intensive instruction in the signs, symptoms, etiology and treatment of the various mental disorders, with emphasis upon the finer points in differential diagnosis, should be given to medical students. The main emphasis in teaching should be placed on the psychoneuroses and upon psychotherapy and it is here that there are many gaps in our undergraduate teaching of psychiatry. Modern teaching schedules, however, are rapidly filling in these gaps through the abundant material in medical wards and out-patient clinics. However, there should be careful judgment shown concerning what is really basic instruction. The extreme behavior of psychotic patients is not basic. The behavior reactions of a patient free from psychosis but ill physically are more important and students should receive considerable experience with the toxic and organic reactions common in general practice. Knowledge of the different types of paranoia, of the various types of the schizophrenic reactions is of little importance to the general physician. It makes little difference whether he can differentiate dementia praecox and manic depressive insanity. It makes considerable difference, however, whether he has some knowledge of temper tantrums, anxiety, fears and the common emotional reactions to be found in every patient who comes to him. It is this material made up of early manifestations of mental disorders which we consider basic in the general teaching schedule. When emphasis in early teaching has been placed on the so-called normal reaction types and the relation of these to social situations, the student with further elaboration can readily enter the study of the psychoneuroses and functional psychoses. Although at the present the objectives of undergraduate teaching should be

PRESENT STATUS OF PSYCHIATRY IN MEDICAL EDUCATION
Division of Psychiatric Education
National Committee for Mental Hygiene.



I—14 out of 68 schools
II—16 out of 68 schools
III—18 out of 68 schools
IV—20 out of 68 schools

I—Schools meeting flexible Class "A" principles for the teaching of psychiatry, 1931-1932 appraisal.

II—Schools making changes which may insure adequate teaching in the near future.

III—Schools deficient in personnel and preclinical teaching that are now attempting to improve their teaching.

IV—Schools of the static type that have not made any noteworthy attempt to improve teaching of psychiatry since 1931-1932 appraisal.

Fig. 1

that of a brief, clear-cut orientation in relation to the major psychoses, there should be greater emphasis on the clinical problems that the physician must deal with daily. Beyond this point undergraduate teaching is specialized and becomes postgraduate in terms of training for a specialty. In terms of our discussion of Class A principles of psychiatry, the teaching of clinical years (assuming that the preclinical foundations have been well laid) should center mainly around the following headings arranged in order of their importance:

(1) The psychoneuroses (anxiety states, hysteria, obsessive states);

(2) Toxic and organic reaction types frequently encountered in general practice;

(3) The psychopathological implications in chronic organic disease;

(4) Psychiatric aspects of convalescence;

(5) The psychopathological problems of childhood; and

(6) Instruction of a pertinent, orientation type concerning the major psychoses.

I agree with Strecker and others in the conservative belief that the first five conditions make up approximately two-thirds of the clientele of general practice during the first ten years of the doctor's professional life. The percentage clearly recognized as psychotic by physicians is, of course, smaller than this. I found, for instance, in my round of visits that well-defined psychoses constitute less than 5 per cent of general practice. We are speaking of psychiatry *in* medicine and not psychiatry *and* medicine, which in the past has meant the isolation of psychiatry from the general hospital and from the general clinical and teaching schedules. Reports of the American Committee on Medical Education by Dr. Rappleye, the League of Nations Report by Burnet, the British Medical Association Report and the recent report on the medical curriculum by representatives of the University of Oxford, Cambridge, and London, the Royal College of Physicians of London, and the Royal College of Surgeons of England on the needs of the curriculum, all express the need for the greater correlation of psychiatry in the teaching schedule for the fundamental basic training of any physician.

This paper is, of course, limited to the undergraduate teaching of psychiatry. Perhaps reference to the teaching in some of your schools would be of interest. The South in general is woefully weak in the teaching of psychiatry, but there are two outstanding examples of what can be done in developing a reasonably ad-

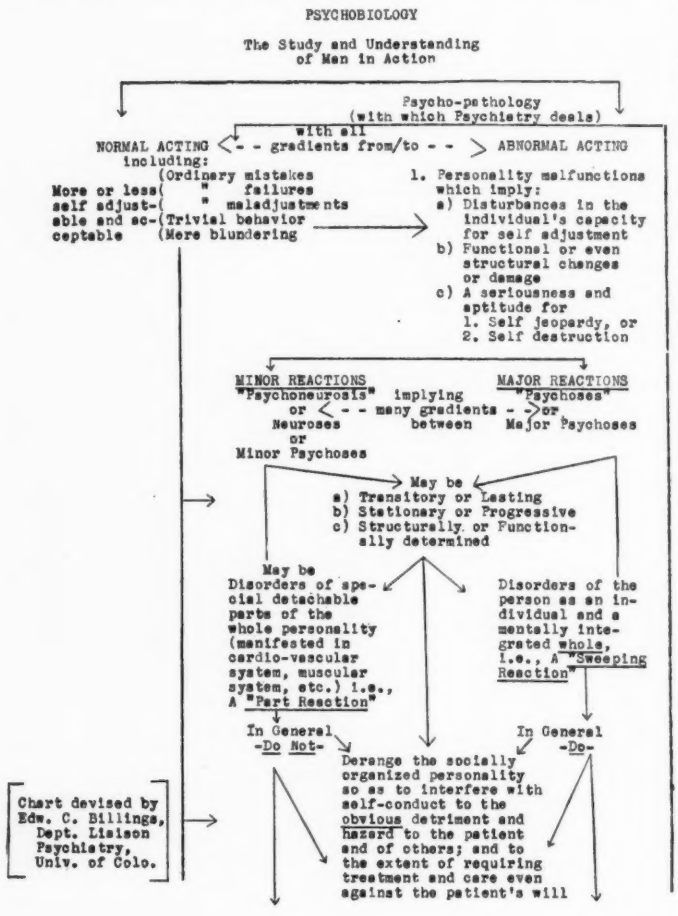

PSYCHOBIOLOGY
The Study and Understanding of Man in Action
Psycho-pathology (with which Psychiatry deals)
with all
NORMAL ACTING including:
(Ordinary mistakes
More or less(" failures
self adjust-(" maladjustments
able and ac-(Trivial behavior
ceptable (Mere blundering
<- - gradients from/to - - > ABNORMAL ACTING
1. Personality malfunctions which imply:
a) Disturbances in the individual's capacity for self adjustment
b) Functional or even structural changes or damage
c) A seriousness and aptitude for
1. Self jeopardy, or
2. Self destruction
MINOR REACTIONS "Psychoneurosis" or Neuroses or Minor Psychoses
implying many gradients between
MAJOR REACTIONS "Psychoses" or Major Psychoses
May be
a) Transitory or Lasting
b) Stationary or Progressive
c) Structurally or Functionally determined
May be Disorders of special detachable parts of the whole personality (manifested in cardio-vascular system, muscular system, etc.) i.e., A "Part Reaction"
Disorders of the person as an individual and a mentally integrated whole, i.e., A "Sweeping Reaction"
In General -Do Not-
In General -Do-
Derange the socially organized personality so as to interfere with self-conduct to the obvious detriment and hazard to the patient and of others; and to the extent of requiring treatment and care even against the patient's will
Chart devised by Edw. C. Billings, Dept. Liaison Psychiatry, Univ. of Colo.

Fig. 2

equate instruction in psychiatry. I refer to the work that is now taking place in the University of Louisville and Emory University. At Louisville Dr. Gardner and Dr. Ackerly, despite their understaffed departments, are giving excellent work to the third and fourth year students who are assigned to the wards in the City Hospital for six weeks' clerkships. Dr. Ackerly emphasizes the social side of medicine and each junior and senior student, while on the psychiatric service, actually makes home visits and social service investigations in addition to the routine physical, psychiatric, neurological and laboratory examinations. Later they present their patients at a staff conference. I am now informed by Dean Moore that the University of Louisville plans to increase its curriculum by the addition of preclinical introductory courses.

The situation at Emory is equally encouraging. We see here in a striking manner what can be done with few facilities, inadequate finances and what amounts to a one-man department of psychiatry. Dr. Young has developed courses in psychobiology during the second year in which he has students work out a personality study of themselves. During the third year there are combined teaching clinics with the departments of medicine, surgery, obstetrics and gynecology. In addition, there is more formal work centering around psychotherapy and a practical discussion of each reaction type. During the fourth year (and this, along with the work of Dr. Ackerly at the University of Louisville is most significant) Dr. Young has arranged for conferences for students with the family welfare agencies of the city; in addition, there is significant work in the penitentiary which enables the student to make individual case studies.

I should like to emphasize these two examples since they demonstrate what the schools can do with a one- or two-man department of psychiatry and incomplete clinical facilities and finances. Many educators have the erroneous idea that the teaching of psychiatry means the establishment of magnificent clinics or institutes (which are certainly worthwhile), heavy endowments, extensive financing for salaries and maintenance, and, in addition, subsidies from various foundations. These things are, of course, most important and have played tremendous roles in the clinical and educational development of the field of psychiatry, but they are not absolutely essential for good work, as the example of these two universities indicate.

I hope I have sufficiently emphasized the importance of avoiding any stereotyped, standardized procedures for the teaching of psychiatry. Flexibility and elasticity are essential. Extreme

NORMAL ACTING
ABNORMAL ACTING
MINOR REACTIONS
MAJOR REACTIONS
(More or less Static and/or)
(Constitutional Types)
Reactions of Developmental Defect or Reactions of Feeblemindedness
I
Psychopathic (and Neuropathic) Constitutions ("Constitutional Psychopathic Inferior")
II
Disorders of Affect
a. Depression
b. Elation
III
Disorders of Content and the Topical Processes. Predominantly
a. Schizophrenic
b. Paranoid
c. Paranoic
IV
Reactions of Delirium (Disorientative-Hallucinatory states with predominant affect of Fear)
V
Reactions of Deficit i.e. Organic Reactions (due to C.N.S. damage focal or general)
VI
TYPES
REACTION
Complaint-Disorders and Substitutive Reactions or "Psychoneuroses" (with or without I or II or both)
1. General Nervousness
2. Tension and Irritable Weakness States
3. Anxiety States and Disorders of Anticipation
4. Hypochondriasis
5. Obsessive-Compulsive Ruminative States
6. Dissociative-Dysmnesic-Substitutive Disorders or Hysterical Reactions
7. Motor Neuroses (tics, etc.)
8. Epileptic and Epileptoid Disorders
Chart devised by Edw. G. Billings, Dept. Liaison Psychiatry, Univ. of Colo.
Fig. 3

points of view should always be discouraged as well as any effort toward regimentation and orthodoxies. There should be frequent pooling of experiences between the various teaching centers and for this purpose arrangements are now being completed for a three-day conference for teachers of psychiatry at Phipps Clinic, Baltimore, in April, 1936.

I should like to present briefly the organization for teaching in our Department of Psychiatry in the University of Colorado School of Medicine in accordance with the following chart,

Fig. 4

again pointing out that each center presents individual opportunities, assets and needs, and local situations which may or may not be conducive to the development of the teaching of psychiatry. We have been most fortunate in our relations with the other groups and in the establishment of a liaison department in charge of Edward G. Billings for psychiatric work in the Colorado General Hospital medical wards and out-patient clinic.

SUMMARY

A few of the main principles concerning the teaching of psychiatry have been presented along with the plea to resist all efforts toward regimentation and extreme viewpoints. Psychiatry should be accepted as a basic part of the training for all branches of medicine and undergraduate teaching should not be presented in terms of a specialty. There have been progressive changes which insure adequate psychiatric instruction in the majority of our medical schools in the near future.

THE SIGNIFICANCE AND CONTENT OF MENTAL HEALTH ADMINISTRATION*

By Walter L. Treadway, M.D., F.A.C.P.†
Washington, District of Columbia

In discussing the significance and content of mental health administration, it may be well to mention, briefly, the material with which mental hygiene is expected to deal; to consider the relationship which a sound and concerted public policy toward such material may bear to practical and abiding results; and to the content and scope of the administrative functions involved.

For many years, the term "mental hygiene" was limited largely in application to what today are classified as the psychoses, the behavior of such patients leading to legal commitment and compulsory segregation for the protection of both the patient and the community. It is this step that is implied by the word "insanity," a term that has no other meaning in medical terminology. In addition to the psychoses, it is now recognized that there is an even larger field of mental illness in which the question of compulsory segregation of the patient or insanity does not arise. This group comprises what is known as the psychoneuroses. Its size and importance as a cause of invalidism and as a problem in national health can best be gauged from the fact that approximately four in every ten persons applying for medical advice in public clinics and dispensaries are invalided because of mental illness of this type. Moreover, it is also recognized that physical diseases often have a psychic or mental component associated with them.

The psychoses and psychoneuroses do not complete the total disorders with which mental hygiene is called upon to deal. To them must be added mental deficiency, or feeble mindedness, as it is more often called, and also a variable proportion of behavior problems now included under the headings of dependency, delinquency and crime. But there is still an additional group of large size, consisting of behavior problems of children and of older persons, who are not ordinarily included with the psychoneuroses, but are the outcome of faulty habits and misunderstandings in dealing with environmental relationships. Such behavior problems, if uncorrected, may be the forerun-

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†Assistant Surgeon General, U. S. Public Health Service.

ners of crystallized faulty mental adjustments in later life or adaptations that are contrary to customary behavior prescribed by society.

There are many who believe that mental hygiene has reached that stage in its development when it is desirable to re-survey its fundamental values and also the security of the foundations upon which it rests. Such a survey may be approached through six broad avenues of interest, including, first, that concerned with the recognition and with the early and adequate treatment of the mentally ill; second, with investigations into the nature and underlying causes of such illness; third, with the training of personnel for undertaking the duties involved in this particular field; fourth, with the adoption of measures to render less threatening a possible increase in the number of mentally ill; fifth, with a more satisfactory solution of the economic problems associated with mental illness; and, sixth, with measures for uprooting community sources of mental invalidism, disease and defect.

In approaching the task of evaluating the adequacy of facilities for the treatment of the mentally ill of a given community or of a political jurisdiction, it must be appreciated, first, that any betterment in the social organization and moral obligations of a self-governing people springs, not from the mind of any one person, but evolves from the congregate opinions and wishes of generations in community groups. Most changes in these fields have been based upon a frame-work of tradition and community principles. These have been flavored, perhaps, by a dash of the spirit of the times, which enthusiastically awakened a public consciousness through emphasizing the humane aspects of a particular social situation. This awakening of public consciousness, ofttimes, has either not been aware, or has not taken into account the basic need for accurate and scientific knowledge in meeting various phases of the problems involved.

For example, in London, where the first abiding steps were taken, about the middle of the sixteenth century, to meet the situation affecting public relief, those seeking aid were divided into three broad groups: first, were the poor children, provided for at Christ's Hospital, which policy has served to influence a traditional background toward the evolution of all those diversified and by no means uniform public policies for the welfare of children; second, were the sick and helpless persons, provided for at St. Thomas' Hospital, or given a license to beg, that early policy traditionally influencing those later and varied policies toward that particular group of the population; and, third, were the sturdy and able-bodied vagabonds, who were gathered together at Bridewell, and for whom occupations were provided, and the "insane", who were cared for at Bethlehem Hospital. The latter for a time was considered as a separate institution, but its separateness in administration existed for a short time only, as early reports show that Bridewell and Bethlehem Hospitals were administered by the same group of men. The influence of these early policies, especially toward the "criminal" and the "insane" still bears its mark upon public outlook, since these principles, adopted in the Old World, followed the colonists to America as part of their philosophy.

Early progress in this country in the matter of attempting to meet the needs of special groups, who constituted special social problems, was stimulated by philanthropies or by appeals to the humane instincts, without recourse to special knowledge of the particular problem involved. With the march of time, however, much has been accomplished for "the child", for "the sick", for "the poor" and for "the bad". History has clearly shown, however, that wherever there are groups of "children", "physically sick persons", "bad men and women" or "poor people," there one finds degrees of mental ill health demanding attention, and disproportionate to that of an average general population. Moreover, every policy that has been set up to deal with these particular situations has been complicated by a mental health administration problem which is not being met in a logical or uniform manner. It is not possible to discuss here the many diversified psychiatric problems involved in connection with the four broad population groups mentioned. It may be desirable to point out, however, that psychiatric practice and mental health administration policies must become more and more closely associated with those agencies which minister specially to the needs of these groups. It is of special importance that private psychiatric practice be more intimately dovetailed and integrated with all general and special medicine and with general and special hospital services, since psychiatry is not only a specialty of medicine, but an aspect of all medicine. One need but mention the psychic components of all complaints of ill health, of maternity, childhood growth and development, adolescence, circulatory, respiratory, digestive and genito-urinary diseases, to appreciate that man is but a psycho-biologic unit

composed of various organs or groups of organs functioning as a whole. To treat the sick successfully these individual psychic components must be recognized and solved.

It is true that public sentiment toward "the child", "the sick", "the poor" and "the bad" has become more charitable with the passage of time, nevertheless there is a paradoxical attitude of public mind toward them, fluctuating between sentimental sympathy on the one hand and condemnation on the other hand.

This paradox is further illustrated by the fact that for the first time in history, a wider interest is now being shown in disorders of the mind by the lay public; failures, unconventional behavior and conduct are being interpreted, not in terms of institutional provisions, but in terms of personality factors having behind them mental implications. Moreover, workers in the mental health fields are being called upon for a greater and greater responsibility and function to the community. Home, school, and other relationship problems are being referred; demands are being made by educational and health services; by industry; by general hospitals; vocational and child guidance agencies; by courts and penal and correctional institutions, and those ministering to dependency, for services that demand an organized and concerted public policy to meet the needs of the mentally ill.

On the other hand, this demand for wider service is inconsistent with the facilities and means now available for the early recognition, amelioration, treatment and care of adverse mental states, or for relieving persons in the incipient stages of mental ill health. Rapid growths in population, coupled with the necessity for securing immediate institutional provisions for those making the strongest appeal, have resulted in the development of piecemeal facilities and policies without regard to an adequately balanced program. Such piecemeal growths have met some of the community's needs and left others, and perhaps equally important needs, unprovided for. In consequence, every stage in the evolution of public facilities and public policies for the mentally ill may be found somewhere represented in the United States today.

The recognition, treatment and care of mental illness implies a knowledge of these diseases; and whereas the present status of medical knowledge makes possible the interpretations of departures in social adaptations and adjustments, not in terms of institutional facilities alone, but in terms of individual needs and requirements; nevertheless that knowledge does not always enter into the formulation or administration of public policies toward the mentally ill of American communities.

As an illustration of the potential needs in this field, it is sufficient to point out that only a very few states or local jurisdictions have seen fit to place their mental health administration problems under the immediate banner and guidance of medical men. In fact, in the majority of instances where central administrative control agencies have been established the executive functions in mental health administration have been assumed largely by lay representatives, without regard for the executive and administrative functions which modern medicine may or can assume. While it is true that no state legislature has kept pace with the needs of the mentally ill, nevertheless in those states where mental health administration is directed by medical men, the facilities and public policies for that group of the population stand far ahead of those jurisdictions where domiciliary facilities alone represent the assumed total of a community's obligation and responsibility toward mental disease and disorders.

Mental health administration in the United States is comparable to that of public health administration of eighty years ago. It is apparent also that the effectual fulfillment of any mental health administration program for a given community or political jurisdiction, involves the development of a department, a division, or a special agency charged specifically with carrying it into effect, and the appointment of a competent, reliable and experienced physician with such necessary deputies and assistants as may be required for the responsible execution of the aims and objectives of such a program.

The content and execution of a mental health administration program embraces the formulation of policies respecting the qualifications and training of medical and technical personnel, both special and general, that are required to meet the problems of mental illness; the enforcement of regulations governing the qualifications and appointment of medical commissions for the detection and certification of mental diseases and defects; those governing the operation of community facilities for the early diagnosis, treatment and care of persons with mental diseases or mental defects, and for inebriates and problem children; those governing the rendering of

expert testimony in alleged mental cases; those governing the mental examination of offenders against the law and the disposition of mentally disordered and mentally defective delinquents; those governing the formulation and supervision of measures and policies concerned with the treatment, care, disposition and general supervision of mentally disordered members of the population, including regulations governing a system of interchange of mental patients with jurisdictions having responsibility for their care; with the development and supervision of facilities and agencies for out-patient and in-patient treatment when needed, and the community supervision of mentally disordered persons when necessary, including the insane, the mentally defective, the epileptic and problem situations manifesting symptoms of mental ill health; and last, but not least, with taking stock of the material with which mental health administration is called upon to deal, so that comparisons may be made from time to time of the conditions under which mental diseases are found, and when they occur, and including an analysis of the omissions and commissions attributed to a given public policy.

The time has arrived when a national health agency must take cognizance of the need for greater uniformity in mental health administration. It is evident that an agency like the United States Public Health Service must eventually assume a more permanent and active role in this particular field by serving as a depository for the collection and dissemination of information on matters pertaining to mental health administration; by making studies and investigations of the prevalence and needs of the mentally ill; and by making available to the states and political subdivisions thereof a consultant service, to the end that more adequate facilities and uniform measures may be adopted for the early recognition and treatment of mental ill health.

This objective may be attained, best, through the cooperative endeavors of those professional groups directly concerned, and, by a demand, on the part of the medical profession, that the execution of the aims and objectives of a mental health administration program be placed under the banner of medicine and directed by members of the medical profession.

The medical profession cannot stand aloof from these obligations, for the standards and policies toward the mentally ill of a community or of a political jurisdiction, reflects either favorably or adversely upon low professional standards.

DISCUSSION (*Abstract*)

Dr. Walter J. Otis, New Orleans, La.—Various manners, means and methods of approaching this complex problem have been mentioned. It remains however for universities and medical departments to instill early in their pupils the importance of recognizing it and being humanely disposed toward their patients.

DIAGNOSIS AND MANAGEMENT OF GONOCOCCAL ARTHRITIS WITH EMPHASIS ON THE USE OF AMMONIUM O-IODOXYBENZOATE*

By J. F. HAMILTON, M.D.
Memphis, Tennessee

Success in the diagnosis and management of gonococcal arthritis is poor when measured by the results obtained under the ordinary methods of treatment. Accurate diagnosis is imperative. Under the management of this disease the foregoing discussion has to do, among other things, with an analysis of two groups of patients: (1) thirty-eight patients treated with ammonium o-iodoxybenzoate (hereinafter referred to as amiodoxyl); and (2) thirty patients treated by the ordinary methods. Amiodoxyl as a remedy has proven, in our hands, to give quicker relief from the agonizing pain, to shorten the period of disability and reduce the percentage of permanent disability, more than other generally practiced therapeutic procedures. We no longer use amiodoxyl in atrophic or hypertrophic arthritis.

Symptomatology.—Pain, fever, loss of function and swelling of the joint or joints preceded by a primary infection, either acute or chronic of the genito-urinary tract, constitute the classical symptoms and signs of acute gonococcal arthritis. Unfortunately this type of arthritis does not manifest itself in a classical manner in all patients in its onset.

Varieties of Clinical Onset.—(1) History of initial infection, with a duration of two days or longer maybe followed by general malaise, perhaps a chill, fever, polyarthralgia, (the latter within 12 to 48 hours almost or entirely disap-

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*From Dr. Willis C. Campbell Clinic.

pearing), to be followed shortly with an acute arthritis in one or more joints.

(2) Initial infection, general malaise, a chill, fever, generalized myalgia and arthralgia may be followed by disappearance of all soreness and pain, except in one or two joints in which an acute arthritis remains.

(3) Initial infection, duration variable, sudden chill and fever may be followed immediately by severe acute mono-articular arthritis. Many of the latter type are of the phlegmonous variety with intra, juxta and extra-articular tissue inflammation.

It is needless to state that in the onset there are modifications of the above onset types. There is the occasional patient who denies the history of gonorrhea, present or past, but upon close pointed questioning will admit having seen a few mornings before the onset of arthritis, one drop of pus, and no more since. But invariably in from two to four days after the onset of arthritis a frank urethal discharge becomes a reality. A single or multiple tenosynovitis may be the only manifestation from beginning to end.

Pain.—The character of the pain in acute gonococcal arthritis is not comparable to the pain in other commoner types of arthritis in that it is much more severe. It requires morphia in full size doses often repeated to produce any degree of relief in the more severe infections in the absence of the use of amiodoxyl. Under the usual methods of treatment of this severe arthritis, due to the long continued pain, the number of hypodermics of opiates administered may frequently approach the danger line of making an addict of the patient.

Fever.—There is nothing remarkable about the fever. It is usually remittent in type and its course is variable. The effect of amiodoxyl as an antipyretic, is remarkable in the large majority of patients.

Loss of Function. — Aside from the milder types of arthritis the loss of function is immediate and complete after the prodromata have passed. The patient will not permit motion in the acute and subacute stages because of the unbearable pain. Herein lies one of the convincing features of the efficacy of amidoxyl therapy in that it will greatly facilitate and shorten the interval when motion may be begun.

Swelling.—Joint effusion and involvement of peri-articular structures are troublesome features. Early in a joint affection an effusion will add greatly to the discomfort of the patient, and injury to the intra-articular structures will follow, more or less, in proportion to the amount and length of time it is permitted to remain in the joint. The phlegmonous type of joint involvement is always to be dreaded and all symptoms are proportionately exaggerated.

Diagnosis.—The diagnosis rests upon a carefully taken history, the demonstration of the gonococcus in a primary lesion, the finding of the organism in direct smear from a metastatic lesion, by culturing the gonococcus from the fluid of an affected joint, and by the complement fixation test. Obtaining a correct diagnosis is of primary importance and doubly so if amidoxyl is to be the method of treatment employed. This must be emphasized because amiodoxyl is not advised in any other type of joint affection unless it is of a local acute streptococcal nature. Experience in treating this latter disease with this drug has been limited and therefore only passing mention is made of it.

Every patient who may be grouped into any one of the above mentioned possible types of onset must be studied with diligence if errors in diagnosis are to be reduced to the minimum. Fewer errors still, would be made if such a case were considered as one of gonococcal origin until proven otherwise. Timidity on the part of both the physician and the patient in history taking, improper and incompletely made physical examinations are pitfalls for errors in diagnosis.

The fact that laboratory workers are still expected to examine and find the gonococcus in vaginal smears (acute vaginitis and urethritis excepted) makes it necessary to mention the utter futility of such waste of time and materials. A properly secured endocervical smear is worthy of the effort.

Bimanual pelvic examination may offer some aid to diagnosis when pelvic disease is found not common to both sexes. On the contrary, prostatic smears yield the gonococcus in many instances long after all clinical evidence of the disease has subsided. A recent experience serves to impress this fact, when a prostatic smear was positive three years following the acute initial infection. The prostate gland is the seat of focal infection in many of the more or less vague joint disturbances, especially of the feet.

Better results in culturing the gonococcal affected joint fluids could be had by closer cooperation between the physician and laboratory technician. The gonococcus was grown in pure culture from two of the thirty-eight treated pa-

tients and found in direct smear from a lesion in another.

Differential Diagnosis.—Only mention will be made of those diseases most commonly confused with gonococcal joint disease, namely; (1) rheumatic fever, (2) atrophic arthritis, acute and subacute, (3) sepsis, and (4) metabolic disease (gout).

Treatment.—The treatment of the joint and tendon sheath complications of a primary gonorrheal infection may be divided, for convenience, into two main divisions, namely:

(1) Orthopedic
(2) Medical

A few of the other methods that have been and are being used, including artificial fever in treating gonococcal complications of the joints and tendons, will be mentioned before relating our method of handling these affections and the end results obtained.

Lavandera[1] following the technic of Ballanger and Elder, injected fluid obtained from an affected knee back into the patient's own gluteal muscles. His result was not so good as those previously reported. Stellwagen[2] resorted to the use of Pregl's solution by injecting it directly into the seminal vesicles through the rectal mucosa, resulting in the cure of joint symptoms and the eradication of the focus of infection. Surgical attack on the affected joint either as aspiration and irrigation or by direct incision and douching out of the joint cavity and sewing it up tightly has been practiced for years. Key[3] and others have been advocates of one or another of these measures. Rudnick and Burstein[4] and others have attempted an attack on the sheath and joint affections by applying medicinal agents through vasotomy incisions. Aspirations and air injections were reported by Porter and Rucker[5] as having been applied in five patients with strikingly satisfactory results. Aspirations and air injections have been used by us, but our insufficient experience with the above mentioned methods makes it impossible for us to draw a conclusion regarding their efficacy.

Fever therapy has long been used as an aid in the treatment of gonococcal and other types of arthritis. Vaccines and other so-called foreign proteins, among other things, have been used to induce the fever. Recently considerable work has been done with artificial fever induced by means of the Kettering hypertherm which seems to offer considerable promise to those to whom it is accessible. Desjardins and his co-workers[6] reported very favorably on the treatment of twenty-nine patients with gonococcal infection, ten of whom had arthritis and were cured.

In our own hands the method of inducing fever by the Kettering hypertherm in patients with the disease under discussion has not received sufficient trial, but our experience up to this writing highly encourages us to pursue its further application.

In a recent issue of the compiled "Abstracts of Papers and Discussions of the Fifth Fever Conference," Dayton, Ohio, there appeared data by Kendell,[7] Strickler,[8] Tenney[9] and Schnabel[10] and their collaborators on the treatment of gonococcal arthritis with artificial fever. This data is somewhat conflicting, but in the main it gives promise to this method of therapy.

(I) AIMS OF ORTHOPEDIC MANAGEMENT

(1) Relief of pain
  (1) Immobilization (traction, splint, cast, brace, sand bags)
  (2) Aspiration
  (3) Moist heat
(2) Restoration of normal joint function
  (1) Diathermy and massage
  (2) Exercise, passive and active
  (3) Ambulatory support (walking cast, brace)
(3) Surgical intervention (ankylosis, contracture)

(II) AIMS OF MEDICAL MANAGEMENT

(1) Relief of pain
  (1) Drugs (a) opiates (b) analgesics
  (2) Diet
  (3) Eradication of the primary focus (G. U. consultant)
  (4) Curative drug therapy; ammonium o-iodoxybenzoate (amiodoxyl)

ORTHOPEDIC TREATMENT

Relief of Pain.—(1) Immobilization is given first consideration in the care of the acute joint. Physiologic rest by means of hypodermics of an opiate may be mentioned. This is immediately followed by attempting to establish rest mechanically by means of traction, splint or cast, personal judgment determining which one, or combination of these methods is to be used.

In a joint with a large effusion, regardless of the type of closed treatment used, aspiration observing strict aseptic technic should be practiced for the following purposes, namely: (a) relief of pain; (b) protection of intra-articular structures; (c) to avoid stretching of peri-articular structures; (d) to reduce to a minimum the formation of intra-articular adhesions. The aspirated fluid should be studied cytologically and bacteriologically, the latter being a useless proce-

dure unless optimal conditions are employed for the growth of the gonococcus. Amiodoxyl seems to hasten the resorption of joint effusion.

The value of moist heat must not be overlooked. Continuouos hot wet dressings, especially to the acute infections, should be applied when possible. The execution of such an order efficiently is difficult except under trained supervision.

Restoration of normal joint function must be the primary objective and should be kept constantly in mind. One should seek out and use that method which will restore or be inducive to the restoration of normal joint function in the shortest period of time. Amiodoxyl is the only drug in our experience that will fulfill this requisite.

Diathermy and Massage.—No one doubts the value of these agencies when applied in the late subacute and chronic stages of gonococcal arthritis. When to begin these treatments is a matter of personal judgment. The presence of enclosed purulent material is a contraindication to the use of diathermy.

Exercise, Passive and Active.—It is not unusual in patients receiving amiodoxyl that passive exercise without pain may be employed after the first, second, third or fourth doses have been administered. Active exercise may follow in a few days. In a number of milder joint affections, particularly those diagnosed as synovitis with effusion, three to five doses of the drug brought about such a rapid return to normalcy of the joint that further chemotherapy was not considered necessary.

Experience is all important in enabling one to decide when exercise should be begun. No one can write a rule to follow, but of all the factors to be considered the disappearance of local fever, perhaps, should be considered primary in determining the time when exercise should be begun.

Ambulatory Support (Walking Case, Brace, Splint).—The type of apparatus necessary depends upon the degree, duration and joint affected. Many patients need no mechanical support. (The osteoporotic painfully tender foot responds most satisfactorily to graduated walking exercises in a walking cast. This type of foot is occasionally seen in long standing, more or less, indefinite infections in or about the foot.)

Surgical Intervention (for Ankylosis or Contracture).—Many patients with arthritis due to the gonococcus who have been mismanaged or improperly treated, and a smaller number who were resistant to chemotherapy, will seek the orthopedic surgeon because of a deformity or an ankylosed joint. It is not within the province of this paper to enter into a discussion of the application of surgery in the treatment of gonococcal arthritis. Suffice it to state, however, that candidates for surgery as herein implied may be divided into two classes: (1) those with ankyloses (fibrous or bony), and (2) those with contractures.

MEDICAL TREATMENT

Pain is a dominating factor in practically all acute gonococcal joint affections and is of such a character that the patient demands relief. The patient with the dejected worn-out look on his face has been seen many times. This picture is due to the prolonged periods of suffering, loss of sleep and rest, and to the inevitable backfire on metabolism from the opiates. One does not observe such a picture when amidoxyl is used. On the contrary, this drug exerts a profound effect in the relief of pain. It is occasionally necessary to give hypodermics to tide the patient through the earlier intervals between doses of amiodoxyl. This we do with impunity.

Analgesic drugs are sufficient to make a majority of our patients entirely comfortable in the interval between doses of amiodoxyl, and these are sparsely used, if at all, after the second or third dose of amiodoxyl has been given.

Diet is a matter that needs but little comment except to say that it should be well balanced, particularly that vitamins should be supplied and the residue be of an alkaline ash character.

The importance of eradication of the initial lesion cannot be too strongly emphasized. The patient should be referred to a competent urologist as soon as the diagnosis is made. There should be no delay in beginning amiodoxyl because of the presence of an acute urethritis. Acute arthritis has been seen to respond readily and promptly to amiodoxyl in the presence of an acute primary focus. No evidence is available that this drug exerts any therapeutic effect on the genito-urinary tract infection.

TREATMENT WITH AMIODOXYL

Young and Youmans,[11] Young,[12] Hedrick[13] and Key[3] all have written favorable reports on the use of ammonium ortho-iodoxy benzoate (amiodoxyl) in the treatment of gonococcal arthritis.

Knowledge of the history of the benzoic acid series of drugs from which amiodoxyl is made

dates back to 1892 when, according to Arkin,[14] Meyer and Wachter were the first to prepare these drugs. The series consists of iodobenzoic acid, iodosobenzoic acid and iodoxybenzoic acid. Arkin,[15] Lovenhart and Grove[16] were among the early workers with these substances.

Various salts of iodoxybenzoic acid such as sodium, ammonium and calcium have been used in the treatment of different types of arthritis in the past ten years. Among those who helped to popularize this chemotherapeutic agent were Young and Youmans,[11] Smith[17] and Trauba.[18] Trauba was among the first, if not the first, to make use clinically of the ammonium salt of o-iodoxybenzoic acid. This form of the drug has been used practically exclusively since 1927 by vein and by rectum. The calcium salt has been prescribed by mouth.

Arkin[15] cites Heinz as the first to make clinical use of the benzoic acid series of drugs when he studied the action of nascent iodine in the body during their use. The marked stimulating action of sodium o-iodoxybenzoate on the phagocytosis of staphylococcus and streptococcus, the production of hemolysins and agglutinins in rabbits, and the antiseptic and bactericidal action for staphylococcus, streptococcus and *Bacillus typhosus* were demonstrated by Arkin.[15 19] The inhibitory influence of the drug on an allergic reaction was shown by Amberg and Knox.[20] Trauba demonstrated a drop in blood pressure, as a rule, due to the drug. A drop in blood pressure, an increase in cardiac output, an increase in bile flow, an oxidizing of hemoglobin to oxyhemoglobin, increasing phagocytosis and stimulation of the formation of specific agglutinins and other antibodies as effects of the sodium salt of o-iodybenzoic acid were reported by Young.[21] He believed the action of the drug was due to its oxidizing qualities resulting in a depression of the sympathetics, thereby increasing the flow of lymph and capillary blood. The drug was found to be excreted in the urine largely as o-iodohippuric acid. Smith[17] showed that amiodoxyl increased the permeability of the synovial membrane. During and immediately following the administration of amiodoxyl marked pain in the affected joints, drop in blood pressure, lachrymation, burning and stinging of mucous membrane of nose, mouth, eyes, skin of face, cuticles, finger tips, ulcers on surface of body, including carious teeth and diseased gums, have all been observed in our patients. Following these reactions marked relief from all or part of the joint pain, rapid disappearance of a joint effusion, marked general improvement in appearance of the patient and the early establishment of passive and active motion have been seen to occur. These effects have been observed following the first and second doses, but more often they follow the third to fifth doses. The exact way in which these effects are wrought is not known.

The use of amiodoxyl in the treatment of atrophic arthritis has received perhaps widest comment. Results in this type of disease in our hands were so poor that we have long since discontinued its use. We consider that the drug's value lies only in gonococcal joint and tendon disease, and in these conditions we consider it

Table 1

AN ANALYSIS OF SIX DEATHS FROM AMIODOXYL

Patient	Doses	Reaction to Amiodoxyl (Danger Signals)					Time—Last Dose to 1st Toxic Symptoms	Time—Last Dose to Death	Nature of Death	Postmortem
		Dyspnea	Fever	Rash	Vomiting	Diarrhea				
1	3	+L		+L			12-14 hrs	24-26 hrs	Sudden	
2	1						7 hours	7-10 min.	Quietly	+
3	3		+P—2 +L		+		30 min.	124 hrs.	Restless Coma	+
4	5		+L		+	+L		8 hours	Restless	+
5	2	+	+P—1				5 min.	30 min.	Restless Coma	
6	3	+L	+P—1—2—3	+P—2—3	+P—1—2—3	+P—1—2—3	20 min.	33 hrs.	Restless Coma	

Key: +, symptoms or signs present. L, after last dose. P, present after doses 1, 2, 3, etc.

second to none in value, if we eliminate the possibilities of artificial fever therapy. In a few instances of joint and muscle infections of a streptococcal nature the results from its use were encouraging.

DOSAGE

The intravenous method of administration is the only one used by us now. The possibility of the patient's being sensitive to the drug makes caution necessary. The first adult dose is never greater than 0.3 gram of a freshly prepared 1 per cent solution in warm sterile normal saline. Succeeding doses are increased by 0.2 to 0.3 gram per dose up to 1.0 gram, provided no symptoms or signs arise to contraindicate this procedure. An arbitrary standard for estimating the initial dose has been set by Smith,[17] which is as follows:

For a patient weighing less than 110 pounds (50 kg.) initial dose 0.3 gram.

For a patient weighing more than 110 pounds (50 kg.) initial dose 0.5 gram.

One gram of amiodoxyl is mixed in a mixing cylinder containing 100 c. c. of fresh warm (not hot) normal sterile saline solution from which the initial and succeeding doses, prepared in similar manner, are given by means of a 100 c. c. syringe. To the adaptor on the syringe is connected a six-inch piece of pliable rubber tubing (Dakin's tube), on the opposite end of which is another adaptor for the needle, 24 to 25 gauge. It is important that ten to fifteen minutes be consumed in the injection of each dose. Thrombosis need not be feared with this method and the danger of giving an overdose is minimized as the administration can be stopped immediately upon the recognition of disturbing symptoms or signs. As many as twenty-three doses have been given a single patient without the slightest evidence of vein injury.

Danger Signals.—(1) Hyperpyrexia (101° F.), (2) macular erythema, (3) vomiting, (4) diarrhea, and (5) headache are considered definite danger signs and symptoms and evidence of a profound toxic reaction due to a sensitivity of the patient to the drug. The moment any one or more of these signals can be recognized, treatment should be stopped, and had best be discontinued for all time. It is believed that at least one death out of six reputed to have died as a result of chemical poisoning could have been averted had due cognizance been taken of the above danger signals. But, on the contrary, Harbinson[22] gave five patients eight daily doses of one gram each, followed by the appearance

Table 2

TREATMENT AND RESULTS ACCORDING TO DIAGNOSIS

Diagnosis by Groups	No. Patients	Amiodoxyl Average Doses	Pain Average Days	Fever Average Days	Hospital Morbidity Average Days	Total Morbidity Average Days	Results		
							Cured	Improved	Unimproved
I. Arthritis, acute	2	6	8a	7a	28a	35a	1	1	
Subacute	2	3	0a	5a	17a	70a			2 (1 died)
II. Serofibrinous arthritis, acute	12	6.6	16	17b	25.2	83.4b	10	2	
Subacute	3	6.0	15	2.3	28.6	47.5d	2	1	
III. Serofibrinous arthritis and tenosynovitis, acute	4	8.2	14.6c	8.6c	27.3c	77c	3	1	
Subacute	1	10	40	0	0	70	1		
IV. Tenosynovitis, acute	1	6	5	0	18	55	1		
Subacute	1	8	7	0	29	55	1		
V. Synovitis with effusion, acute	6	5.3	6.5	11	13.1	34.3	6		
Subacute	1	6	8	0	18	32	1		
VI. Purulent arthritis with periarticular cellulitis, acute	5	8.6	10.2	27.2	46.2	141.5e		2	3
Totals	38						26	7	5
Per cent							68.5	18.4	13.1

Key: a—1 pt. b—11 pts. c—3 pts. d—2 pts. e—4 pts.

of almost all of the danger symptoms and signs above enumerated, without a single fatality. In our experience in not more than six out of many patients treated has treatment had to be discontinued on account of untoward reaction to the drug.

Analysis of Treatment and Results.—Thirty-eight patients were treated with amiodoxyl and thirty were not. The amiodoxyl treated group will be considered first. The youngest patient was 16 and the oldest 51 years of age. Twenty-seven of the thirty-eight were males and eleven were females. Seventeen (62.9 per cent) of the twenty-seven were cured; seven (25.9 per cent) were improved and three (11.1 per cent) were unimproved. "Cured" denotes restoration of practically normal joint function; "improved" signifies that somewhat limited painless useful motion was recovered; "unimproved" means that no useful motion was obtained. The cured and improved males totaled twenty-four (88.8 per cent) of the thirty-eight patients. Nine (81.8 per cent) of the eleven females were cured and two (18.1 per cent) were improved. The cured of both sexes numbered twenty-six (68.42 per cent). The total of the cured and improved of both sexes were thirty-three (86.84 per cent).

Among the seven patients grouped as improved were four who withdrew before sufficient treatment had been given. These four patients had active urethral infection at the time they quit treatment. One of the four belonged to Group 6 according to diagnosis. The other patient classed as improved in Group 6 responded to treatment slowly and was almost a morphine addict upon admission. Treatment was begun in the tenth week of arthritis in each of the two patients in Group 6. It is therefore reasonable to assume that several of the seven patients in the improved group would have been cured provided their full cooperation could have been obtained.

Three of the 5 patients classified as unimproved fell into Group 6, while the other two fell in Group 1 under subacute arthritis. One of the unimproved in Group 1, after receiving only three doses of amiodoxyl, had to return home. A small amount of painless motion was possible when she left the clinic. She was sent home in a plaster of paris cast. Ankylosis in the knee resulted. An arthroplasty was performed one year later, and a year following the arthroplasty she had 90° motion in the knee. The other unimproved patient in Group 1 died of chemical intoxication following the third dose of amidoxyl. The results of chemotherapy in Group 6 were discouraging. Ankyloses developed in two of the three patients in Group 6 in spite of full courses of amiodoxyl. Treatment was begun in the first and fifth weeks of the arthritis, respectively. A severe and troublesome folliculosis of the skin about the knee complicated treatment in the former patient. The third patient in Group 6, after showing evidence of improvement, developed symptoms of intoxication which necessitated withdrawal of treatment. His knee became ankylosed.

Except in diagnostic Group 6 the number of doses of amiodoxyl considered necessary was fairly uniform. Groups 2 and 5 gave the best results in proportion to the number of doses given. Group 5 was especially responsive to treatment.

Table 3

RESULTS OF TREATMENT ACCORDING TO INTERVAL OF FOCAL INFECTION TO ONSET OF ARTHRITIS

Interval Focal Infection to Onset of Arth. by Weeks	No. Patients	Smear		Pain Average Days	Amiodoxyl Average Doses	Analg. Average No.	Narco. Average	Fever. Average Days	Hosp. Morbid. Average No. Days	Total Morbid. Average Days	Results		
		N	P								Cured	Improved	Unimproved
Group 1 First week	6	1	5	10	6.6	77.6	4	20.8	25.2	69.2	4	1	1
Second week	2	1	1	20	11.5	77.5	17	21	33.5	180a		2	
Third week	8		8	10.1b	7	22b	1.7b	14.6b	35.6b	81c	4	2	2
Fourth week and over	17	1	16	14.1d	6.2	19.7e	2.8e	12.1e	25.8e	63.6d	14	1	2
First to fourth, indefinite	5	1	4	11.2	6.8	11.2	0	5.2	21.9	81	4	1	

Key: a—1 pt. b—7 pts. c—6 pts. d—16 pts. e—13 pts.

Results Compared with Interval Between Infection and Onset of Arthritis.—Best results were obtained from the use of amiodoxyl in patients who had had a primary infection for four weeks or longer. There were seventeen patients of the thirty-eight so classified. Fourteen (82.3 per cent) of the seventeen were cured. Of these seventeen patients:

DURATION ARTHRITIS BEFORE TREATMENT

No. Cases	Weeks	No. Cases Cured
2	1	2
5	2	5
3	3	3
1	4	1
3	5	2
3	6	1

This analysis emphasizes the effectiveness of early treatment of the arthritis. The fact that best results were obtained in those in whom the primary infection had existed four weeks or more may be significant. The active immunity so induced may have played an important part in producing the end results. It should be remembered that a salt of o-iodoxybenzoic acid previously mentioned was shown to have stimulated the formation of immune bodies.

Thirty Patients Not Treated with Amidoxyl.—Private and complimentary patients compose this group. Twenty of these were admitted in the chronic stage of the disease while the remaining ten were admitted while still in the acute stage. No patient was included except in whom there was every reason to believe that the arthritis was of a Neisserian origin. The analysis of this group is very incomplete because of lack of chart data. The treatment these patients received in a general way was that usually given. A number of these patients returned to their homes diagnosed as unimproved and improved and were never traced. But the fact that so long a time interval had elapsed between onset of arthritis and the time they were last seen

Table 4

RESULTS ACCORDING TO WEEK OF ONSET OF ARTHRITIS TO BEGINNING OF TREATMENT, AND AN ANALYSIS OF THIRTY PATIENTS WHO RECEIVED NO AMIODOXYL

Week of Onset to Tr. Groups	No. Patients	Smear		Amiodoxyl Av. No. Doses	Pain. Average No. Days	Analg. Average	Narco. Average	Fever. Average No. Days	Hosp. Morbid. Average Days	Total Morbid. Average Days	Results		
		N	P								Cured	Improved	Unimproved
1st week Tr.	6		6	6.5	7.1	17.1	2.9	16.1	23.1	53a	4	1	1
No amio.	3	2	1		57e	324e	32e	31.3	43.6	96.3	1	2	
2nd Tr.	7		7	6.3	10.1	80.8a	2.4a	14.8a	21.2a	49.4	6	0	1
No amio.													
3rd Tr.	9	2	7	6.3	14.6b	28b	4b	14b	28.5b	76.4c	7	2	
No amio.	1		1						13	50		1	
4th Tr.	3		3	9.6	17.5e	13e	0.5e	10.5e	47e	70	3		
No amio.	4	1	3		36.2	199.6g	19.5e	17	36.2	65.5	1	1	2
5th Tr.	6	1	5	7.5	14.6	23.6a	0.2h	11.8a	37.8a	83.6	3	2	1
No amio.	1		1		36	133	15	26	50	143			1
6th and over Tr.	7	1	6	6.6	14.9f	31.1	7.0f	8.6	22	107.5f	3	2	2
No amio.	21	20	1		19e	17e	1e	3h	92.2c	151d		7	14
Av. by Groups Tr.	38	4	34	7.13	13.4	32.2	2.8	12.6	29.6	73.3	26	7	5
No amio.	30	23	7	0	37i	110.6i	16.8i	19.3i	47j	101.1j	2	11	17
Grand total (Gen.) Tr.	38	4	34	6.9	12.4	39.1	3.4	14.3	27.5	71.4	26	7	5
No amio.	30	23	7	0	37	176.7	20	21.2	75.1	131.5	2	11	17

Key: a—5 pts. b—8 pts. c—7 pts. d—16 pts. e—2 pts. f—6 pts. g—3 pts. h—1 pt. i—total 4 groups averaged. j—total 5 groups averaged. Pts=patients.

serves to demonstrate the inadequacy of their treatment. When these results are contrasted with those of the group treated with amiodoxyl the marked superiority of the latter treatment is apparent.

There were ten ankylosed joints among the thirty patients not treated with amiodoxyl. Among the other twenty, according to last reports, two joints were practically ankylosed and six were certainly headed for ankyloses. Of these eighteen patients twelve were definite candidates for surgery. Four arthroplasties were done, two on the same joint, and two others were advised. One osteotomy was performed.

Results Compared with Time Between Onset of Arthritis and Beginning of Treatment Among Non-Amidoxyl Treated Patients.—The number of patients for comparison is unavoidably small. The figures are adequate, however, for illustrating the end results in two major groups of patients. Those treated with amiodoxyl resulted in 68.5 per cent cured, 18.4 per cent improved and 13.1 per cent unimproved, while the non-amiodoxyl treated group yielded 6.6 per cent cured, 36.6 per cent improved, and 56.6 per cent unimproved.

Attention is called to the fact that the figures representing hospital and total morbidity in the groups of thirty patients are much lower than the true figures would be as the full number of days was not known in a number of patients. The opposite is true, but to a lesser degree in the treated group of thirty-eight. "Compensationitis," inconsistent treatment and a few who wished to remain in the hospital longer than was actually necessary for physiotherapy treatments were among some of the reasons for the higher than necessary hospital and total morbidity rate in the latter group.

Response to amiodoxyl, according to duration of arthritis in weeks, was as follows: fourth week, 100 per cent cured; second week, 85.7 per cent cured; third week, 77.7 per cent cured; first week, 66 per cent cured; fifth week, 50 per cent cured; and sixth week, 42.8 per cent cured, respectively.

CONCLUSIONS

(1) The profession at large is in great need of an improved method of treatment of gonococcal arthritis.

(2) Certain clinical symptoms strongly suggest the diagnosis. Such patients should be considered as victims of gonococcal infection until proven otherwise.

(3) Diagnosis is of primary importance always, in every disease, but especially in this disease if amiodoxyl is to be used.

(4) General outline of the plan as applied to our patients is discussed.

(5) Special emphasis is placed upon ammonium o-iodoxybenzoate (amiodoxyl). Its actions and uses, its dosage, dangers and toxic effects are discussed. It is considered to be a most valuable chemotherapeutic agent in the treatment of gonorrheal arthritis.

(6) Among other methods used in the treatment of gonorrheal arthritis, artificial fever therapy gives most encouragement to those who are using it.

(7) Attention is called to favorable reports of others upon the use of amiodoxyl.

(8) Data are presented concerning reported fatalities from amiodoxyl, results from its use in our hands, results according to the interval between infection and onset of arthritis and according to the interval between development of arthritis and beginning of treatment.

(9) The results in thirty-eight cases treated with amiodoxyl and thirty patients not treated with amiodoxyl are contrasted.

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DISCUSSION (*Abstract*)

Dr. John B. Youmans, Nashville, Tenn.—As one of those responsible for the introduction of this drug, I feel I should make some comment. I am often asked whether I have continued to use the drug. In case any of you have this question in mind the answer is "Yes". I can corroborate Dr. Hamilton's results in gonococcal arthritis in which the drug is particularly effective, quickly relieving pain and swelling, shortening hospitilization and securing a good functioning joint in a high percentage of cases. It is true, of course, that other measures also may accomplish this result. In rheumatoid arthritis I still feel, as stated in earlier publications, that the use of the drug combined with other indicated measures gives better results than the same procedures without the drug. In connection with the harmful effects it must be borne in mind that there is danger in any intravenous injections and in part the difficulties encountered may be those which might result from any intravenous injection and are not peculiar to the drug. In view of the many thousands of treatments given the few fatalities encountered indicate that it is no more toxic than many other substances given similarly.

Dr. Hamilton (closing).—There is no longer any question in our minds of the value of amidoxyl in the treatment of gonorrheal arthritis. There is no other known chemotherapeutic agent that will in any way compare with it when measured by results obtained. However, I must reemphasize this fact, namely, that it is a dangerous drug but it may be used without compunction if the warnings laid down in the paper are observed and properly appreciated.

If artificial fever proves to be a superior method of treatment, amidoxyl should then be held in reserve for that patient who because of some contraindication could not take the fever treatment. Moreover, there are and will be for some time to come numbers of patients who cannot and will not have access to artificial fever, who with small expense may be given amidoxyl with everlasting benefit.

TREATMENT OF THE IRRITABLE COLON*

By JEROME S. LEVY, M.D.
Little Rock, Arkansas

The terms "irritable colon" and "unstable colon" are preferred from amidst the babel of names one finds in the literature.[1 2 3] The former is more descriptive of the actual functional disturbance present. "Irritable" means "sensitive to any stimulus," or simply sensitive to stimuli. Certainly that is true of the irritable colon.

The purpose of this paper is to discuss the treatment, not to describe the symptomatology, diagnosis, pathology, *et cetera,* of this clinical picture. In a previous paper[3] the different theories and ideas respecting these phases of our subject have been reviewed. The results in a series of seventy-two unselected cases will be discussed. This series is small in total number. Careful analysis of a small number of cases may indicate what a larger series will show. Experience does not necessarily consist of seeing hundreds of cases, but rather of learning the most from those one does see. It is with this thought in mind that the treatment of these cases of irritable colon is to be presented.

The first step in the therapy of any condition is correct diagnosis. The physician must understand his patient as well as the disease. The two are of equal importance. By careful and patient history taking, by thorough examination of the patient, the ground work for treatment is laid. The cause of the irritable colon is sought. In this series 70 per cent had had a diagnosis of or still had evidence of a pathologic appendix, gallbladder, or pelvic organs; 32 per cent had been operated upon previously, fifteen having lost their appendix, three their gallbladder. In studying the histories of these patients it was noted that a number had been operated upon without relief of their symptoms; eighteen out of a sub-group of thirty-two. Careful analysis showed that the diagnosis of appendicitis was doubtful in most, unquestionable in but a few. In each, a rigid, usually deficient diet had been given and continued for indefinite periods of time. In none had there been any attempt at dietary guidance subsequent to op-

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*From the Department of Medicine, University of Arkansas School of Medicine.

eration. In the cases in this series that have been subjected to surgery, continuation of dietary care for a number of months after operation has been emphasized. The postoperative results so far have been gratifying. When evidence of appendicitis is found, the possible connection with the irritable colon is discussed with the patient. If it is not clearly defined, the patient is treated as outlined for some time. If relief is not obtained, operation with subsequent observations is advised. In thirteen of this series, definite clinical and x-ray evidences of appendicitis were found. On treatment by diet and sedatives, four obtained relief of all symptoms, three required appendectomy with subsequent treatment before they were relieved; no records have been available in five; one received no relief. This one had had recurrent attacks of acute appendicitis. Numerous adhesions and partial obstruction of several loops of the small gut were found at operation. This patient has failed to cooperate since and has not been relieved of all of her symptoms.

Most of the cases with cholecystitis have not responded satisfactorily. Of fourteen, three were operated upon, one died, two obtained but fair results. Three of the fourteen obtained good results, three fair; that is, but six can be considered improved. It is probable that this is due to the secondary hepatitis and pancreatitis resulting from a long-standing focus of infection, the gallbladder. Had removal been accomplished years before, a greater chance for relief might have been offered.

The role played by the diet in the etiology and in the treatment of the irritable colon is important. In a number of these cases the history disclosed that the patient had been on a limited, frequently deficient diet for some time. Because of a chronic gallbladder, chronic appendicitis or nephritis, a physician may restrict the diet and keep the patient on such restrictions for months, sometimes for several years. A secondary anemia, weakness, breathlessness and palpitation, the various digestive disturbances associated with gut irritability, and x-ray findings of spasticity of the colon with colonic motor delay soon follow. A number of patients voluntarily restrict their diet for one reason or another. Finding no improvement, the diet is further restricted and the patient fears to eat. He is concerned about his gastric symptoms. Further study reveals that many of these patients have taken cathartics regularly during childhood. These drugs rush food through the digestive canal. They irritate the intestinal mucosa. This disturbs absorption from the intestine and keeps the gastro-intestinal tract in more or less constant turmoil. Thus, partial deficiencies may result, even though a well balanced diet is being eaten.

Further, one may observe a similarity between the digestive disturbances of the outright deficiency diseases and those of the irritable colon. Experimental studies[4 5 6 7] that have been reported in the literature since McCarrison's work in 1920 add further conviction to our belief that the role played by partial vitamin deficiencies is more than a casual one. While each vitamin plays its own part, the B complex apparently is the main one.

A diet to meet the needs of the patient with irritable colon, most authors are agreed, should be a bland, low residue one. If, in addition, the accessory food factors are supplied by means of one of the various products on the market, an ideal diet is made up. Clinically, we have noted that the addition of brewer's yeast is a material aid, particularly in the nervous patient with neuritic pains. As long as the yeast is being taken, improvement usually continues. Neuritis, most frequently described as pains in the back of the neck and shoulders, remains quiescent. Soon after the yeast is discontinued, however, these pains tend to recur. In a few patients, yeast causes gas and bloating. Other vitamin B preparations may be given in its place. An ideal diet will include cereals (no bran mixtures), eggs, tea, toast, butter, cream, fruit juices, strained soups, fresh fish, fowl, beef, lamb, liver, peas, spinach, asparagus tips, lettuce, tomatoes, squash, rice, and egg and cream custards. The vegetables are puréed to break up the cellulose. This serves two purposes: first, it permits access of digestive juices to portions which may be held in the meshes of the cellulose fibers; secondly, it permits access of the bacteria in the cecum to the cellulose itself. Contrary to popular belief, milk is not a low residue food. Therefore, it is not given. Thirty-two per cent of the patients in this series had recognized their inability to drink milk because of the gas, distention or cramping that it caused. These are in addition to the allergic group, several of whom reacted to milk with intradermal tests. Carbohydrates and fluids are limited. Foods rich in carbohydrates are low in vitamin content. Various investigators have noted that excess starches and excess fluids seem to inhibit absorption of vitamins.[4 5 6] In the majority of patients in this series, when the carbohydrate content of their diet was increased,

there was a recurrence of the distention, bloating and gas formation.

Allergy plays a part in a number of cases. Careful study by means of a food diary in every case suspected of being allergic frequently points to the offending foods. Elimination of these foods from the diet usually suffices.

In addition to the elimination of the irritating stimuli as above suggested, mechanical irritation may be alleviated or avoided by use of mineral oil by mouth and warm oil retention enemas at bed time. The mineral oil should be given in sufficient dosage to cause a loose stool, and should be gradually reduced in dosage until formed, but soft, stools are evacuated. Those patients unable to use the oil because it leaks through or is passed without fecal matter may use mineral oil-agar-agar mixtures (those without laxatives) or the mucin-like substances now on the market.

Treatment, also, must be directed towards the nervous factors which many present. The gastro-enterologist needs to be a trained psychologist and psychiatrist. Discussion of this phase could take up the entire allotted time. Freidenwald,[9] Bockus[10] and others[11 12 13] believe that the psychogenic factors are the dominant etiologic ones. That may be. It is unquestioned that inability to stand up under the strain of ordinary social and business life may evidence itself by the breaking of the weakest link, in these cases the digestive tract. Not infrequently many visits are required before the patient will discuss his family worries, his business cares or his financial dilemmas. Women patients will hesitate a long time before they tell the physicians of their emotional instability, their fears of pregnancy, sexual worries, household and family cares. One must be an economist as well as a minister to solve some of the problems presented. One's sympathetic attitude towards those problems takes the patient a long way on his road to their solution and his or her return to health.

Most of these patients have been to a number of physicians. Relief is obtained for a short time. Recurrence robs the patient of his confidence in his new doctor. When a diagnosis is made, an explanation is given the patient, telling him of the functional disturbance present and the probable course of events. This is as full and complete as his intelligence permits. On the basis of complete and thorough examination, the patient can be assured that there is no organic disease present. He is told that recurrence cannot be avoided, that every psychic and emotional upset, every dietary indiscretion, any intercurrent illness will cause a flare-up. These will be farther and farther apart, however. Each one will be less severe than its predecessor, although often times seemingly as bad during the attack. After a number of months the patient begins to realize he has had no attacks for some time or such minor ones that he pays no attention to them. When these attacks occur, the physician can reassure him by reminding him that they were to be expected. He then remains with the physician, his confidence is kept and one is able to continue with the appropriate plan of treatment.

It is necessary to use a sedative and an antispasmodic at the start of the regime. There are none better than sodium bromide and phenobarbital. By these, reception of stimuli is diminished. In addition, the phenobarbital appears to aid in relaxing the spastic gut. Belladonna or small doses of atropine sulphate aid in many patients. These may be combined in one prescription. Occasionally this alone will relieve the constipation by overcoming the spasticity.

Finally it is necessary to instruct one's patient to develop regularity of bowel habits. A definite time to move the bowels should be set. The patient should remain at the stool for twenty or thirty minutes whether a movement occurs or not. At any time during the day that the stimulus for defecation arises it should be obeyed, regardless of what the patient may be doing. Postponing defecation is one of the first steps in causing constipation. One must explain this to the patient and re-explain. If not, an occasional patient may try to keep from moving his bowels at other times than that arbitrarily set. It is wise to advise that it will be six to eight weeks before regularity of habits will be established.

In summary, the treatment of the irritable colon has been outlined. The results in a series of a small number of cases have been shown. An attempt has been made to describe how these patients are to be handled. The etiology, symptomatology and diagnosis have not been discussed except as they bear directly on treatment. Further studies of the relationship of the partial deprivation of vitamins to dysfunction of the gastro-intestinal tract are necessary. One seldom sees a pure vitamin starvation in a patient. Unquestionably, a partial starvation is not only possible, but probable. Our knowledge of these conditions is meager. With fuller knowledge,

possibly some of the confusion about the irritable colon will be unraveled for us.

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ABDOMEN CONSCIOUS*

By ARTHUR W. WHITE, M.D.
Oklahoma City, Oklahoma

It may seemingly be a far cry from Dr. Axel Munthes's "San Michele" in which he discusses at length a very general intangible disturbance of the nervous system under the term colitis to the recent writings of Bargen on a very tangible pathologic state under the term ulcerative colitis.

May it not be that this gulf is apparent rather than real; that the one may be a prominent but underlying factor making the other possible?

As one analyzes the histories of patients suffering from any type of fixed colon disease he is impressed by the question, "When did this condition really begin?" as the symptoms often precede any positive evidence of real trouble.

I wish to emphasize a few points which are often treated carelessly or are misunderstood and which hinge largely on the close relationship between what, in a broad sense, is designated as the general nervous system and the abdominal organs, principally the stomach, duodenum, and colon.

The stomach is frequently referred to as the barometer of the body. That is, pathological disturbances anywhere may and do, by reason of direct connection with the digestive tract, produce symptoms referable to the abdomen as well as secondary changes in its organs as, for example: angina pectoris, myocarditis, tonsillitis, brain tumor and renal disorders. This may be explained by Head's law:[1]

"When a painful stimulus is applied to a part of low sensibility which is in close central connection with a part of greater sensibility the pain produced is felt in the part of greater sensibility."

Again, it may be due to a direct toxic influence, or to a circulatory disturbance, or in the case of renal or ovarian disease through the splanchnic system, or to a transmitted influence through the vagus, both of which have an effect on both the secretory and motor action of practically all units of the digestive tract producing symptoms simulating in part those of definite organic disease in the stomach or in the colon. These influences, producing at first only false evidence and directing the attention of the observer away from the site of disease, may and often do produce functional derangement and later definite organic disease in, for example, the stomach.

We are all familiar with this situation in the case of appendicitis, which, if the appendix is removed or spontaneously healed after short duration, is characterized by prompt disappearance of the gastric or colonic symptoms. On the other hand, in many of the cases of longer duration the bowel or stomach symptoms continue after the appendectomy until the patient begins finally to question the veracity or ability of the surgeon who operated upon him, imagining the appendix still remains. A careful investigation at this time reveals peptic ulcer or a chronic colonic spasm.

Functional disturbances occur in all of the organs of the body and in some instances antedate and even cause organic lesions, but nowhere is this so true as in the organs of the digestive tract. It is safe to say that the great majority of pathologic conditions in the digestive tract precede the demonstrable evidence of pathology. It is not uncommon for a patient who is suffering from distress with a proven hyperchlorhydria to be told after a careful investigation that he is suffering from a functional derangement and that no disease can be found. This same patient presents, one or two years later, unmistakable evidence of an active ulcer.

Again, the physician is frequently consulted because of symptoms referable to the abdominal organs which are not classical; have no real significance as to organic disease; which are not due to pathology anywhere in the body; and which lead to the diagnosis of neurosis or psychoneurosis. Undoubtedly many of these patients are true neurotics, the symptoms being the immediate direct result of suggestion by a friend, a newspaper article or patent medicine advertisement or as a result of an irritation, though

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slight, from the use of unnecessary laxatives and over-emptying of the colon.

Obviously there must be an underlying deeply planted suggestion or idea keeping the mind of the patient focused on his digestive or bowel function.

As Dr. Frank Bodman[2] says, often undue emphasis is placed on the bowel function in early life: "The child is told he is a good child or a bad child in accordance with the bowel function at that particular time." A moral issue is made of a physiological function. As the child grows older his attention is called to the great necessity of this regular reflex.

The idea of elimination of poison from the colon is more and more emphasized, finally becoming a bug-a-boo, until, because of a developed fear complex, this physiologic action is over-stimulated in a desire to conserve health. If the individual is exposed to a cold or other disease he rushes to take a cathartic. Unfortunately physicians, more often, doubtless, in the past than of recent years, have been heavy contributors to this false philosophy; introducing treatment of any situation with heavy catharsis. "Keep the bowels open" has become a popular slogan, and the laity has become so conscious of the abdomen as to suggest it as the source of all symptoms from whatever disease may be present. If to this there is added the pain produced by taking a cathartic pill it is easy to understand why the first symptom mentioned by any patient on consulting his physician is abdominal discomfort which he usually attributes to "gas."

H. G., a bachelor, 43 years old, came under my observation several months ago, complaining of gas, saying that he had always been troubled with gas, that his mother had always to watch him to keep down the gas. Investigation revealed an irritable colon with every evidence of a chronic caloused type of ulcer, prepyloric. He responded unusually well to management, leaving the hospital at the end of the fourth week symptom-free, bodily functions normal, with no evidence of activity of the ulcer and a marked lessening of the defect as shown by fluoroscopic examination.

One week later he reported that he was not feeling well on account of abdominal pain, but his bowels were "fine now, moving freely three or four times daily." When asked why he had taken a cathartic contrary to instruction, he reported that his mother had given it to him for fear he might develop gas.

Later he was advised to take his vacation alone. He refused and did take his mother with him. This man, although a successful business man and apparently having a normal mentality, has never married. It is the opinion of the writer that it was because he would not have his mother to "look after his gas." This is an exaggerated instance of misguided parental interest that without doubt created a psychological background favoring the development of disease and is illustrative of the situation with many persons who develop trouble in the abdominal organs.

This propensity is well understood by the patent medicine manufacturers and venders of faddist foods. It is evidenced by the fact that most of their propaganda stresses elimination, hence contributes much to increase attention of the abdomen. The patient, whether he be tired or suffering from any sort of disease, after reading a magazine or listening to the radio, promptly resorts to one of the much vaunted laxatives, thereby producing abdominal symptoms and strengthening the foundation for the development of disease.

The nervous mechanism of digestion is such as to call attention to the digestive tract or abdomen. The regurgitation or vomiting of bile after a period of anger has been referred to frequently in the literature, both lay and medical, since the time of Homer. We are all familiar with the effect of sudden shock or grief on the appetite as shown by Homborg and Bogen.[3]

Pavlov[4] showed the importance of appetite juice in the starting of digestion. When one must eat or does eat without appetite or takes food prepared or served under circumstances that make the meal repulsive, discomfort and a feeling of distention or weight in the epigastrium result, probably due to the delay of starting of the gastric juice.

It has been demonstrated many times by those in experimental work that various types of foods consistently produce varying effects on the functional activity of the gastric glands. Lobster, salt fish and lean meat have a definite stimulating effect on the acid bearing glands, while fat shows an inhibitory action. Hence, one with a normal digestive response on a diet consisting almost wholly of either type of food will sooner or later develop a functional derangement with symptoms.

The modes of eating and living are further sources of dyspeptic symptoms. Certain individuals, the traveling salesman, the oil field worker and the woman with heavy social duties are outstanding examples. Irregular hours, rapid eating, rich foods, insufficient sleep, stimulating beverages, eventually bring about the symptoms often referred to as acid indigestion: slight gas-

tric distress, eructation of sour material, and so on.

This type of patient, when no evidence of organic disease is demonstrable, is often told that there is nothing wrong and that he should "forget it." He promptly goes to a druggist who sells him some one of the several alkaline preparations on the market which gives him relief. He continues in the error of his ways to develop later a peptic ulcer, gallbladder disease or malignancy; or he may consult a member of one of the numerous cults, who advises him how to live and to eat so that his disturbances disappear.

Pavlov, by stimulating the sciatic nerve, brought about a drying up of gastric secretion which lasted for several hours. We are all familiar with the achlorhydric state of patients suffering from rheumatoid arthritis or neuritis, which may explain the improvement of these cases on a low starch, high protein and high vitamin diet, which is best tolerated by patients with this type of digestive imbalance.

The marked frequency of hyperchlorhydria with symptoms in certain toxic states as hyperthyroidism and pulmonary tuberculosis is well known. Again, the reaction of the patient to a fixed pathology in the digestive tract varies in different individuals. One may have a ruptured viscus due to a so-called "silent ulcer," the patient never having had pain; another suffers intensely with a slight rise of hydrochloric acid. The varying threshold of pain may be a misleading diagnostic point.

Certain anatomical abnormalities within the abdomen, as for example an atypical position of the great omentum, which Draper and Johnson[6] state is "heritable and amenable to the Mendelian Law" or undue pressure of the mesenteric stump on the duodeno-jejunal junction, produce symptoms only by bringing about a disturbance of digestive function which may be difficult to interpret.

Hence the psychogenic, somatogenic and neurogenic factors in the production of functional disturbances with or without symptoms are obvious. In the clinical study of disease, especially in its functional stage, both the psychologic and physiologic status must be considered. Hence, the common denominator of disease is that underlying factor, the fundamental make-up and environment of the affected individual.

As scientific progress has gradually lifted the profession out of the slough of empiricism into the field of mathematical medicine, the individual is often forgotten in the search for pathology. This may explain in part the increasing inroads made by those practitioners who know nothing of disease, hence must treat the patient.

Might it not be well at this time, while considering ways and means of reducing the number of physicians, to examine ourselves to determine whether we are fulfilling our duty to society in restoring efficiency and commanding the dependence of the public on the regular physician as was once true.

The subject is an intangible one to deal with, which probably explains its neglect. As Draper[6] says, "This sixth medical sense is well nigh impossible to transmit to students."

The growing tendency of teachers in medical schools to discard the patient for the demonstration of a biochemical change or a pathological entity is notable. But as most students will become general practitioners, some information on functional derangements should be offered. Until physicians and neurologists of the S. Weir Mitchel type are developed, those in this field would not be interested nor have the clinical material.

Hence, because of the abdomen-conscious attitude of the average individual in this age, the reference of symptoms in disease anywhere to the abdomen, the internist interested in gastroenterology should assume this responsibility, on account of his extensive experience with this class of patients.

In conclusion, then, it is important that we bear in mind the primary function of the physician, that is, to conserve and restore comfort and efficiency for the individual, whether it require correction of functional disorders or the cure of a pathological or perverted biochemical state. Further, it seems important that more time be given in our medical schools in instruction concerning functional disturbances as one of the means of curtailing the inroads of the cults on the practice of medicine and maintaining the physician in his rightful place.

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Dr. Lea A. Riely, Oklahoma City, Okla.—Physician's reception rooms all contain a great number of in-

dividuals who are abdomen conscious. They consult the internist, the psychiatrist, the neurologist, as well as the surgeon, and each specialty can find among the group a cogent reason for accepting them as patients.

The individuals who are abdomen conscious are the most frequent patients who consult physicians. They are divided into three etiological divisions, namely: psychogenic, neurogenic and omatogenic. These three types are not always separate and distinct, but have factors which interlap or merge one into the other.

Back of these groupings one must consider the genes they inherited, the body build, the social, economic and marital background before he is able properly to interpret the symptoms and history elicited. No class of patients offers so many diagnostic pitfalls or so taxes the ingenuity of one's therapeutic armamentarium. These patients are the ones that formerly filled the fashionable spas and consulted the faddist physicians and now are able to act as a barometer of the stock market and economic readjustment. These are the ones who flaunt their ills in every social gathering and gloat over the fact that thank God they are miserable.

The above statements apply to the psychogenic who encompass the greater class.

Murry says, "The outstanding trait in colitis patients besides fearfulness is their emotional immaturity and in this respect they differ from the gastric ulcer individual's emotional development."

In the neurogenic type there is a perverted function of the sympathetic or parasympathetic with all of its protean symptomatology forming a liaison between the other two types. The psyche of the one can help to cause symptoms of neurogenic nature. The somatic background of the other may so transmit the impulse (Head's law) that the stomach will act as a mirror of trouble outside the abdomen. Under the nervous control we may liken the gastro-intestinal tract to a railroad with a block signal equipment causing normally an orderly transit caudad but going forward and backward or awaiting at a siding according to impulses sent from various extraneous origins. This may be due to a railroad crossing of some foreign line, or trouble of its system arising along the main line. The extent of the disturbance may not be confined to one division alone, but may cause symptoms along the whole system. Hence this remote control may be very baffling to the physician who tries to ferret out the seat of the trouble.

The nervous abdomen needs the highest developed diagnostic acumen so that these individuals are not falsely branded as neurotic, where the pathology is definitely somatic.

The diagnoses of nervous indigestion and neurasthenia should never be made until a thorough survey of the system is proven to have no physical basis to explain the symptoms. Gas on the stomach or bowels may be due to gallbladder and other secretory disturbances, as well as to swallowing the air. Genito-urinary tract symptoms frequently masquerade in other domains. One must remember Osler's dictum, "When the stomach is at fault look to the heart, and when the heart is at fault, look to the stomach".

HYPERTENSION*

By I. W. Cooper, M.D.
and
Leonard Hart, M.D.
Meridian, Mississippi

Without doubt hypertension is on the increase, exacting heavy toll both in disabilities which are often of a permanent nature and in mortality. One should do all in his power to prevent or postpone development of the increasing number of chronic cardiac invalids and nonfatal cases of paralysis which are practically beyond medical help.

The term, blood pressure, has been used to denote the pressure in the arteries under all conditions. In fact, it is the arterial tension that is lowered or raised, so the proper term should be arterial hypertension or arterial hypotension, as the case may be.

There are two levels of intra-arterial tension: the systolic which is the maximum pressure within the arteries during cardiac systole, and the diastolic pressure which is the minimum pressure. This is maintained by the elasticity of the aorta and the peripheral resistance, particularly of the arterioles. It must be remembered that the diastolic pressure reflects the peripheral resistance and is the chief index to the arterioles' tonus and the systolic pressure is equal to this plus the force of the left ventricle.

The early recognition of hypertension is of the utmost importance since after definite anatomical changes have taken place, the damage does not respond to treatment but is irreparable.

The only stage where much can be done is in the beginning when the hypertension is in what is known as the "potential hypertension" stage, and, possibly, in the second stage which is known as the spastic stage.

Every physician should impress upon his patients the necessity of periodic examinations, particularly after the patients have passed middle life.

At each physical examination the arterial tension should be taken regardless of the age of the patient, for this will often give very valuable information, particularly, if a surgical

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procedure is anticipated. A knowledge of the status of the circulation is imperative for the best interest of the patient. It is negligence on the part of the surgeon if this information is not obtained before any operation is attempted, regardless of the age of the patient.

The technic of taking blood pressure is very simple but there are pitfalls that will lead to erroneous interpretations of readings. We are familiar with the nervous type of patient who walks into the office and requests that his blood pressure be taken. He is keyed up to a high pitch, hardly giving us time to remove the stethoscope from our ears before he requests our findings, and he constantly keeps his eyes on the mercury. Can we expect a true reading in such a case when we know that the mental or emotional state plays an important part in arterial tension? The systolic pressure will, of course, be too high, giving a false reading.

Before taking the blood pressure the patient should be put at ease, and if he seems excited or nervous, he must be given a chance to relax and quiet down.

Another source of error is in raising the cuff to too high a tension, thereby constricting the arm, causing pain and discomfort which cause increased tension.

A leading Boston internist says that he takes three rapid readings in succession in all cases and accepts the lowest systolic and diastolic as the fairest.

To interpret our findings, when the pressure within the cuff produces a constriction of the part and cuts off the circulation there will be no sound in the vessels below the constriction, but when the pressure within the cuff is reduced to the point where the blood begins to flow, a sound becomes audible through the stethoscope. At the moment the first sound is heard the manometer reading is taken and that is known as the systolic blood pressure.

The diastolic tension, quoting from Stieglitz, "is determined lower on the scale at a point where a very characteristic change in note is heard." It was formerly thought that the diastolic pressure was where the sound ceased to be audible, but, according to most observers, this has been proven to be wrong. The complete disappearance of sound may occur at a pressure very little below, or many points below, the true diastolic level. The average difference between these two points is about 5 mm., but the error may be as much as 55 mm. In many cases of aortic regurgitation we get a very low reading before the sound disappears.

Still quoting from Stieglitz, "During deflation of the cuff five distinct phases of sound are to be heard." The first sounds are sharp clicks resembling the normal heart sounds. The second phase is longer than the first phase. The sound has a hissing or blowing character and is similar in tone and mechanism to a true hemic murmur. These sounds are transitory and depend upon the difference in pressure above and below the constriction. The third phase is due to a stretching and relaxation of the arterial wall. The sounds are dull thuds. At the beginning of the fourth phase these thuds are suddenly and abruptly muffled. It is at this point that the diastolic tension is to be read on the manometer. This muffling occurs when the arteries no longer collapse during diastole. This phase is usually short, and the disappearance of all sounds marks the appearance of the fifth phase. To quote from J. F. Daley:

"The average normal tension for all adult ages is about 127/85 for men, and 123/81 for women. The range of normal diastolic tension in adults is from 70 to 85 for men. The maximum normal arterial tension, regardless of age, may be considered 140/90 and a systolic tension of 150 or more and a diastolic tension of 95 or more constitute hypertension. A systolic tension of 105 or a diastolic tension below 60 constitute hypotension. However, on account of the physiological factors entering into the equation it is necessary to leave a reasonable margin between the maximum normal and the minimum normal hypertension figures."

The mechanism of control of arterial tension is due to four cardinal facts, namely: force of the heart beat, tonicity of the arteries, peripheral resistance, and the volume of blood thrown out at each heart beat, or the volume of blood circulating through the system. A variation in any of these facts will alter the arterial tension.

The course of hypertension, arterial disease, can be divided into four stages. Again quoting from Stieglitz: "These stages are clinically distinguishable and correspond closely to the major pathological phases." (1) The stage of potential hypertension disease is defined as an intermittent and recurrent appearance of the state of arterial hypertension. Clinically, this phase is illustrated by emotional hypertension, early thyrotoxicosis, and by unusual lability in response to standard stimuli.

(2) In the spastic stage, the habit of arterial spasm has existed for some time, and has resulted in medial muscle hypertrophy. Here

the arterial hypertension is much more persistent although still widely fluctuant. The reduction of the lumen is still purely spastic and the arterial tension can still be temporarily reduced by the use of vasodilators. Mere eradication of the initiating etiologic factors does not suffice to arrest the progression. The perpetuating factor is now operating.

(3) The intermediate stage is partly spastic and partly sclerotic. The arterioles slowly become fibrotic and lose their power of independent contraction and relaxation. There is a long transitional period in which both the spastic and beginning arterial sclerotic elements play a part in arterial hypertension, but as the arteries lose their elasticity they become more rigid, the peripheral resistance increases, and the arterial hypertension fails to fall under therapy. Particularly, the diastolic tension becomes less variable.

This stage gradually passes into the fourth which is called the sclerotic stage. Here the arterioles have undergone extensive sclerotic changes. The diastolic tension is quite rigid. In this stage the changes are permanent, irreparable and not amenable to therapy.

At present there is no universally accepted classification of arterial hypertensive disease. Fundamentally, there is but one disease which goes through the stages enumerated above. The disease may vary in its rate of progression, or be associated with complications, such as nephritis, cardiac disease, or cerebral sclerosis. Many of these complications are the direct results of localized arterial changes, for example: apoplexy from changes in cerebral vessels; retinitis, due to change in the retinal vessels; myocardial insufficiency and coronary occlusion, due to changes in the coronary vessels.

The onset of symptoms in hypertension, or arterial disease, is slow as are the anatomical changes responsible for the complaint; however, sudden changes in the caliber of the arterioles cause sudden, transient, often violent, symptoms in the parts supplied by the affected vessels.

This sudden rise in tension, which one author calls apoplexy of the blood pressure, may be precipitated by some psychic or toxic cause. The symptoms referable to the brain vary from simple headache and vertigo to monoplegia, hemianopsia, and, in some cases, convulsion.

As the arterial hypertension progresses many important areas of the body suffer increasing damage. Evidence of such injury may appear insidiously, as in the development of myocardial exhaustion with slowly diminishing cardiac reserve, ending in congestive heart failure; or in the kidneys, in nephritis. However, the first subjective symptom may be ushered in abruptly, by apoplexy or coronary occlusion.

Thus the symptomatology of arterial hypertension varies, from no subjective symptoms to severe symptoms of transitory manifestation, to the final stage where the symptoms are permanent and non-amenable to treatment.

Here it would be well to consider some of the symptoms referable to the fourth stage of hypertension, arterial disease. We shall consider them under the general classes without enumerating many of the lesser symptoms.

(1) Cardiac hypertension and dilatation, coronary occlusion, myocardial insufficiency, and finally, congestive heart failure.

(2) Cerebral arteriosclerosis, restlessness, unstable emotions, arteriosclerotic dementia, and apoplexy.

(3 Arteriosclerosis of the renal vessels, finally resulting in the contracted kidney.

The discussion of arterial hypertensive disease would not be complete without considering the ophthalmic changes that take place. Occasionally they are the first subjective symptoms. Black scotoma, general blurring of the vision, and, sometimes, acute transient blindness may accompany arterial crisis. Localized areas of visual loss, irregular disturbed visual field are more enduring as they are lasting evidence of permanent retinal injury; however, in some acute intoxications retinal edema and exudate create only a transient blindness. A continuation of the intoxication may result in permanent blindness.

Every case of arterial hypertension should have an ophthalmoscopic examination by a competent oculist as this examination frequently gives the internist valuable information for the examination of the ocular fundi, and permits direct inspection of the retinal arteries and veins.

The earliest visible changes are a slight tortuosity of the smaller retinal arteries and compression of the retinal veins where they cross the arteries.

With the increase of fibrosis a glistening white line of reflected light appears along the edges

of the arteries; later beaded constrictions of the arteries may be noted with increased tortuosity and obliterative compression of the veins at the point of crossing.

When the actual changes are extensive, hemorrhagic areas scattered over the retina appear. Usually when retinal edema and exudate occur the arterial hypertensive disease is accompanied by some general intoxication.

Again the ophthalmoscope may reveal evidence of choked disc or papilledema indicating increased intracranial pressure. So, when an oculist refers a patient to you with some of the findings mentioned above, do not treat it lightly but go into minute details with the patient and try to clear up the findings.

True, there may be extensive sclerotic changes in the retinal vessels with little or no evidence of advanced sclerosis elsewhere, but usually the degree of damage in the retinal arteries parallels the damage in the cerebral vessels.

It should be emphasized that the diastolic tension represents the peripheral resistance to the flow of blood, and, thus, reveals the degree of arterial constriction. The systolic tension equals the diastolic tension plus the propulsive force of the left ventricle. If the diastolic tension is elevated, the systolic tension must rise to maintain the circulation and the compensatory systolic rise is in excess of the requirement, and, as long as that condition exists, it shows a better cardiac reserve strength for when the diastolic tension is high and the systolic pressure rises but little a weakening of the left ventricle is denoted.

Persistent diastolic hypertension is more indicative of predominant sclerotic change than transient hypertonia. If the diastolic tension remains stationary and high, the outlook is bad because it denotes extensive arteriolar sclerosis and is usually associated with changes in the arteries of some, if not all, the vital organs.

The question naturally arises: "What can the patient expect when he is told that he has hypertension?" We know that the first and second stages are really the only stages that are amenable to treatment, the third stage only to the extent that the spastic condition plays its part, and the fourth stages is not amenable to any treatment as the spastic element is slight if it is present at all.

There is a test used that gives valuable information as to the stage of the disease. I refer to the amyl nitrite test. Again quoting from E. J. Stieglitz at some length:

"The technic of the amyl nitrite test of arteriola spasticity is very simple. The patient can be either sitting or lying down, although the latter is preferable. The patient then inhales, deeply, three or four times of a pearl of amyl nitrite while rapidly repeated observations of the blood pressure are made. The tension falls very quickly, therefore, it is essential that the readings be made hastily. The tension reaches its minimum in thirty to fifty seconds, and then rises again but not so quickly as it falls. The significant observation is the minimum diastolic tension. This minimum level is attained very quickly after the onset of the inhalation, and usually occurs shortly before the intense facial flush appears. It must be stressed that speed in making the readings of the blood pressure is imperative lest the minimum level be missed. It may be sometimes advisable to disregard the systolic tension so that the fall of the diastolic tension may be followed accurately. The significant observation is the approach of the diastolic tension to or below normal levels."

In early spastic hypertension the diastolic tension will fall below normal levels, but, with increasing sclerosis, the percentage of approach toward normal becomes less and less. We quote again from Stigelitz:

"A man fifty years of age has an arterial tension of 210/130. His minimum tension after inhalation of amyl nitrite is 140/105. Thus, the diastolic pressure fell twenty-five points. As 130 mm. is 40 points higher then the maximum normal tension of 90 mm., the fall of 25 mm. is equivalent to a 62 per cent approach toward normal. From this, it may be concluded that about one-third of the diastolic hypertension is due to sclerotic constrictions which are unaffected by the vasodilators, and two-thirds to arteriolar spasm."

In practice it has been found that in more than ninety per cent of cases, the clinical course, under therapy, confirms the impression gained by this test.

In periodic physical examination always take the manometer reading to detect hypertension, if it exists. Repeat the reading on several occasions and see if it persists, paying strict attention to the diastolic pressure as it is the index to the peripheral resistance. Familiarize yourselves with the ophthalmoscope. If you do not do so send your doubtful cases to the ophthalmologist for an examination of the ocular fundi because the retinal arteries and veins are the most readily visible vessels of the body and will give valuable information. The examination of the ocular fundi is especially useful in estimating the status of the cerebral vessels. The amyl nitrite test in estimating the stage of the

hypertensive arterial disease, is an aid to prognosis and therapy.

DISCUSSION (*Abstract*)

Dr. J. E. Knighton, Shreveport, La.—The essayists have done a real service in emphasizing the importance of recognizing the presence of hypertension in the stages at which helpful measures may be instituted. It is always in order in a discussion of this subject, to emphasize the value of periodic physical examination. A note of warning should be sounded regarding overtreatment of the patient who is found to have hypertension, but who otherwise is enjoying perfect health. This applies particularly to unreasonable restrictions of diet which result in unjustifiable loss of weight and strength, thus converting the individual into a state of inefficiency and invalidism, not as a result of the disease, but of the treatment.

During recent years there has been considerable discussion in current literature as to the relationship of hypertension and endocrine dysfunction. In this connection, I shall very briefly report a case which came under my observation recently. The patient, a white woman, aged 69, was known to have had hypertension for several years She was admitted to the hospital on February 10, 1935, complaining of the presence of an enlargement in the lower left side of the abdomen. The general physical examination was essentially negative except for the palpable mass in the left side of the abdomen, and blood pressure of 200 systolic and 100 diastolic. Pyelogram of the left kidney showed complete obliteration of the upper calices. The right kidney showed a normal pyelogram. The patient was operated upon by Dr. W. B. Allums, on February 11, 1935. The mass proved to be a tumor involving the upper pole of the kidney and the adrenal gland. The pathologist reported the presence of adrenal tissue distributed throughout the tumor, which showed no indication of malignancy. The patient was dismissed from the hospital on February 22, 1935, at which time the blood pressure was 160/90.

Recent reports from the patient are to the effect that she has remained perfectly well, and that the blood pressure has remained about the same as recorded on leaving the hospital.

The results in this case suggest that some of the cases of essential hypertension may be benefited by surgical removal of a portion of the adrenal glands, just as some cases of hyperinsulinism are benefited by removal of a portion of the pancreas.

We are all more or less familiar with work that has been done in the way of deep x-ray therapy over the region of the adrenal glands. We realize that the problem of the etiology of hypertension is far from settled, but we look forward hopefully to future developments along this line.

Dr. O. B. Zeinert, St. Louis, Mo.—The discussion of Drs. Hart's and Cooper's paper on a subject which in volume is second to none in the literature today, appears a great task; however, I have been asked to present some of the observations and methods of handling this type of case among railroad employes.

Recently, with enforced reductions among railroad employes in all departments of service, only those with long years of service have been retained and consequently the average age has advanced several years, with the result that a larger number of employes than ever before are in what we may call the "cardiovascular renal period of life". This brings us in contact with many cases of hypertension yearly; hypertension uncomplicated or essential hypertension, and hypertension complicated by cardiac, renal, cerebral and other disorders. Each particular case presents an individual problem involving careful examination to determine the extent or amount of involvement of the heart, kidney, blood vessels, eye grounds and vision. In other words, high blood pressure in railroad employes means much more than the manometer reading, and determination as to fitness for work depends on the extent of the complication rather than the extent of the blood pressure reading.

To be sure the general rule of disqualifying men for train service with a systolic pressure of 190 or more, or a diastolic of 100 or more, may be and is a worthy one; however, a patient may be a far greater risk with a blood pressure of 160 associated with myocardial damage than a man with a higher pressure which is uncomplicated.

We consider every case where the systolic is over 170 and the diastolic over 100, a hypertension case and the patient is requested, through his employing officer, to report for physical examinations at regular intervals. This type is considered in the yellow zone. Those who have passed into the red zone, with a diastolic of over 100 and a systolic over 180 to 200, should be examined more frequently and their service restricted. All cases over 200 should not be permitted to work.

We check all by roentgenogram, electrocardiogram, examination of eye grounds, and so on, and in most cases a preliminary observation while confined in the hospital.

The most accurate guide, as to determination of the ability to do any type of work safely, we find, is in the amount of exertion the patient can stand without undue breathlessness or fatigue and without undue rise in the heart or blood pressure. This is determined in different ways according to the severity of the disease from a certain set amount of work over a set of steps to actual trial on his job.

Factors which are known to influence blood pressure such as emotional strain, obesity and other untoward influences are cut down as much as possible during the trial period.

We have used the nitrite test in certain cases, but not as a routine measure. We feel that it has a definite place in the prognosis of hypertension. In establishing a prognosis in hypertension we constantly must keep in mind two factors, first the safe guarding of the patient's health in any particular line of work; second, the safety factor in hazardous positions, which concerns the welfare of others, both of a physical and economic nature.

ERYTHEMATOUS LUPUS, LICHEN PLANUS AND PSORIASIS: A PATHOLOGIC TRILOGY*

WITH SPECIAL REFERENCE TO THE TREATMENT OF LICHEN PLANUS WITH PITUITRIN

By J. N. Roussel, M.D.
New Orleans, Louisiana

In March, 1922,[1] I called attention to some blood pressure observations in erythematous lupus, lichen planus and psoriasis, and I then suggested that they might be of value in directing the treatment of these diseases.

As to erythematous lupus and psoriasis, I was strongly inclined to believe that they were, at least, an indication of which way the wind blew, so to speak, but in the case of lichen planus I was then quite convinced that they were of distinct value.

In psoriasis, the blood pressure is uniformly low. It appears to drop as the disease progresses in point of time. The older the disease, the lower the pressure. In old cases, the systolic pressure is usually below 100, and often as low as 85 millimeters of mercury. Raising the blood pressure fifteen or twenty points, without any local applications, markedly tends to dissipate the eruption: in some cases completely, in others partly. When the blood pressure falls, the eruption reappears.

In erythematous lupus, I have invariably found the blood pressure low, and much as in the case of psoriasis, the older the disease the lower the pressure, but I made no attempt, until recently, to ascertain what effect the elevation of the blood pressure would have on this disease process. It appears to have a distinctly favorable influence, and I am quite convinced that, as a synergistic measure, it would add measurably to the success of the present method of treatment.

In lichen ruber planus, or the lichen of Wilson, the blood pressure appears to be low from its incipiency. Raising the pressure fifteen or twenty points induces a complete subsidence of the eruption in the course of a very few days, ten or fifteen at most. On the other hand, in the cases of hypertrophic lichen planus, the blood pressure has been uniformly high. Lowering the pressure also had the effect of causing the eruption to disappear, but not so rapidly.

From these observations I am inclined to the belief that these three diseases are closely allied: that they form a pathologic trilogy, so to speak, and, like the Colonel's lady and Judy O'Grady, they are "sisters under the skin."

I believe they are metabolic in origin and directly dependent upon a dysfunction of the thyro-adrenal-pituitary sympathetic system, and that the cause of the dysfunction is different in each disease and is probably acting at and affecting a different part of the sympathetic network, producing a varying pathologic picture, amenable to therapeutic control only when the proper hormone shall have been applied, or when the proper string will have been pulled, so to speak.

That a dysfunction of the ductless glands is probably at fault in these diseases is, of course, not new to any of you. It has been suggested many times, especially in so far as psoriasis is concerned, and I know that several have suggested the probability that lichen planus might likewise have an endocrine origin, but so far as I know, no one has previously applied hormone therapy to the treatment of lichen planus. Every one seems to be satisfied that the heavy metals, arsenic, mercury and bismuth, are the agents of choice in its treatment, and it is to the therapy of this disease that I wish especially to call your attention.

Of course, from my point of view, raising the blood pressure was a *"sine qua non."* How to do it was the question uppermost in my mind, and one about which I had many misgivings, and could get no help from my friends.

A few years ago pituitrin was thought to possess marked blood pressure raising qualities, and I selected it as the agent of choice for the purpose at hand.

Now it is not generally conceded that pituitrin does what we once thought it did. In the case of lichen planus, however, it raises the low blood pressure and it stays up, and it lowers the high blood pressure and it stays down. In other words, like all good rules it works both ways, which is quite compatible with the latter day conception of the blood pressure control.

Burn[2] claims to have amassed considerable evidence to prove that the same factors which raise the blood pressure may also lower it. Their function is not simply to raise the blood pressure, but to control it, and this pituitrin appears to do with amazing certainty. How it does it is, of course, an unsolved problem, the solving of which will probably constitute one of our foremost futilities.

*Chairman's Address, Section on Dermatology and Syphilology, Southern Medical Association, Twenty-Ninth Annual Meeting, St. Louis, Missouri, November 19-22, 1935.

Of course, I do not subscribe to the idea that the mere raising of the blood pressure is curative in itself. The pituitary seems to have a multiplicity of functions. It has been called the "wonder world" of the ductless glands, and recent developments tend to suggest a pituitary control over practically every other glandular structure in the body. It has solved the mystery of the beriberi heart; it is said to make the hair grow, to correct the cryptorchid, and to warm the cockles of the slumberous gonads, either of which might well "confound the philosophic experts and leave the skeptics to wonder."

It has been suggested that probably a combination of epinephrine and pituitrin might better serve our purpose, but I am much of the opinion of the Scotch horseman who bought a single spur, for two reasons, he said: first, because it was cheaper, and second because he was convinced that if one side of the horse went, the other side would follow.

Pituitrin is a safe agent. It does not entail the tragedies that often follow in the wake of epinephrine. Its only bad feature is that it may cause a sudden and uncontrollable desire to defecate, but this can be largely avoided by giving a small dose at first. I have found that 0.5 c. c. of obstetrical pituitrin is quite sufficient to begin with. This contains five international units. The dose should be increased as required, using the blood pressure as a guide. Therefore, the blood pressure should be taken at least every other day.

I have not found it necessary to use more than ten international units, which were given every second or third day, and six doses has been the maximum number required up to this writing.

It controls the pruritus as if by magic and the papules fade away with uncanny regularity, but a remarkable amount of pigmentation seems to follow this disappearance of the eruption, probably more so than in the cases treated with the heavy metals.

While the number of cases treated was not large, only ten of the acute type and four of the chronic hypertrophic type, I am of the opinion that if the binomial theorem is correct, and, apparently it is, these should be as convincing as a larger number more imposingly arrayed.

Pituitrin was one hundred per cent effective in the acute cases, but in the chronic hypertrophic type only 50 per cent yielded. In the other 50 per cent it seemed to have no more effect than so much water, which made me suspect that some inhibition existed in these individuals the nature of which was not clear.

In his Welch lecture a few months ago, Professor J. B. Collip[3] described his discovery of what he called antihormones, which he believes to be present in the normal subject. Their presence possibly accounts for the observation that while the effects expected from the administration of potent endocrine preparations are frequently attained, occasionally an individual who should be promptly cured by such agents not only fails to improve but becomes worse.

As I look back at those whom pituitrin spectacularly relieved of their lichen planus, most of them had had much treatment. They were sick and tired and faint and worn, the personification of what the endocrinologist is pleased to define as vagotonia, and it might well be that it will work only in this type of case.

If the sympatheticotonic individual ever has lichen planus in either of its manifestations, I am quite convinced that pituitrin would not be the agent of choice in its control.

To speculate further upon the subject would take us too far afield, so with these observations and with abiding faith in your wisdom, I leave the matter with you for your consideration.

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PHYSIOLOGICAL RELATIONSHIP OF THE NOSE AND EYE*

A STUDY IN THE EFFECT OF CHAULMOOGRA OIL ON THE NASAL MUCOSA

By T. J. DIMITRY, M.D.†
New Orleans, Louisiana

This contribution purposes to awaken an interest in the excitation of nasal passages as a treatment of certain eye diseases. It is to bring forth interesting facts that are commonly overlooked by otolaryngologists and ophthal-

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*From the Department of Ophthalmology, Louisiana State University Medical Center.

†Professor of Ophthalmology and Director of the Department, Louisiana State University; Professor of Special Anatomy, Loyola University.

mologists in the intimate neuro and vascular association of the nose and eye. It is a study in the effect of chaulmoogra oil on the nasal mucosa.

Chaulmoogra oil, after instillation into the nose, is beneficial to the eye. At first, it was thought that the benefit came from improvement of a pathologic condition of the nose. Subsequently, it was noted that the effect occurred independently of nasal disease, and it was concluded that improvement was due to excitation of reflexes that begin in the nose and extend to the eye.

Chaulmoogra oil was first observed to be helpful when used in the nasal channels of lepers, who suffer great accumulations of secretions in the sinuses and nasal passages. Later, it was shown to be beneficial to non-lepers with similar impediments. It was noted that it clears the nasal passages and makes breathing easier. But how could this occur when a hyperemia of the mucosa was produced, and, moreover, how could it prove beneficial to the eye?

Chaulmoogra oil in the nasal passages acts as an irritant, producing a burning sensation and a hyperemia of the mucosa. It also excites changes that improve nasal breathing. Had it impaired breathing, there would have been no difficulties to answer, for the hyperemia that irritation excites and the increases of tissue volume in consequence are accepted as natural.

It is a recognized fact that snuff is a nasal irritant, and, following its use, breathing is improved. It is not, therefore, unreasonable to accept chaulmoogra oil which has the same action and effect. It is equally well recognized that tickling of the nose with a camel's hair brush not only causes hyperemia of the nasal mucosa and better nasal breathing, but it also produces an increased hyperemia of the conjunctiva. Mustard oil has the same effect under similar conditions. From these facts we conclude that irritants can be utilized to improve nasal breathing.

CONTROL OF VESSELS IN THE EYE

It continues to be the ambition of surgeons to influence vascular changes in the eye, hoping to benefit the patient by affecting their lumina. The sympathetic nerve ganglia in the neck and the ciliary ganglion about the eye have been severed for this purpose. In section of nerves, there is destruction; in irritation, on the contrary, an excitation. This treatment therefore, develops nerve control of the vessels of the nose and eye.

The vascular supply to the eye and to a part of the nasal organ is from the ophthalmic, a branch of the internal carotid, but the turbinates, which supposedly swell when irritated, receive their supply from another source, the maxillary, a branch from the external carotid. The control of these two major streams differs as does the control of the respective vessels without and within the eye. Though the vessels to an organ are continuous as arteries, arterioles and capillaries, it is not to be concluded that they respond alike to the same stimuli. It is recognized that they do not.

Certain drugs are known to have different effects upon the arterioles and capillaries. Epinephrine, for instance, increases arterial pressure, but does not alter the capillary pressure. Irritation of the sympathetic has very much this same effect, while the sensory nerve endings, particularly those of the surface of the skin and mucosa, have quite a contrary effect.

Acetyl-choline and histamine cause a fall of arterial pressure, the first, by dilatation of the arteries so that the capillary pressure may rise, and, the second, by dilating the capillaries.

The conjunctival, uveal and retinal vessels respond differently to stimuli, and because of this it may be correctly said that there are two vascular systems for the eye: the first, the uveal, and, the second, the retinal. The uveal circulation is made up of the anterior and posterior ciliary arteries, which are of the greatest importance for the physiology of the eye. The retinal vessels in this respect are less important.

The control of these vessels can be traced to the sympathetic nerves. These fibers are found in the uveal tract and in the nerve of Tiedemann to the retinal vessels. The constrictor effect through the sympathetics on the uveal tract is certain; on the retinal circulation, uncertain.

Vascular changes can also be brought about by irritation of a sensory nerve. When one sensory nerve supplies two organs, irritation of it in either organ will affect both organs. There is but one sensory nerve for the eye and the nose, namely, the trigeminal. The effect that is brought about over the sensory nerve is from an impulse traveling in a contrary direction, antidromic.

THE TRIGEMINAL

The endings of the sensory nerve rise up

between the epithelial cells of the nasal mucosa. In the eye, they terminate with the sympathetic as plexuses and are interspaced with ganglion cells throughout the uveal tract. A damp mucous sheeting protects them throughout the nasal passages and sinuses. When the mucus is acted upon by certain chemical agents, such as chaulmoogra oil, its constituents, glucose and protein are brought into action, and excite, or permit excitation of the mucosa that contains the nerve endings in the nose. Other proteins than the broken up mucus, will also provoke reactions in the mucosa. The stimuli which the nerve carries do not all pass the Gasserian ganglion to the brain or cord. Some are reflexes on a branch of the same nerve, even though it is an afferent nerve and the impulse should have traveled otherwise. Many of these impulses are distributed to the muscular walls of the blood vessels of the eye and affect their tone. This axon reflex is well developed in man and is abolished when he suffers from bulbar paresis. The dilatation of the blood vessels produced by such stimuli is obtained not through an action on the parasympathetics. There is doubt that any parasympathetics exist for the control of the vessels of the eye, and this is equally true for the nose. If there should be any parasympathetic fibers, they would course with the fifth, having a beginning either in its mesencephalic root, or in a nucleus of the seventh, or they may even course with the sympathetics. If they are in existence and affect the vessels of the eye and the nose, the course mapped out would place them where they could be irritated.

OBSERVATIONS IN NERVE EXCITATION

Repeated experimental work has been done and the observation made that the superficial and deep conjunctival vessels are affected by irritation of the nasal mucosa. It is concluded that the effect is due to an axon reflex. The effect on the uveal and retinal vessels has been studied. The conclusion as concerns the choroidal vessels, when the sympathetics are irritated, is definite. The retinal effect is indefinite. Morat and Doyon noted after stimulation of the cervical sympathetic in dogs a constriction of conjunctival vessels and a dilatation of retinal vessels. In rabbits, the action was reversed. Leriche observed in man a dilatation of the retinal vessels. Bailliart could not confirm these findings. The author did not note any constant effect on the relative size of the retinal vessels though changes were noted after nasal irritation.

The discussion of vascular changes might include the Loven reflex, the axon reflex, and the inhibition reflex. Any explanation may be offered of the effects of nasal irritation and the benefit that could come from irritation. I do not attempt to explain the result, even in part. It is believed that the naso-ocular reflex can be utilized therapeutically.

PERMEABILITY

Neither dilatation nor constriction of vessels *per se,* nor increase nor decrease in the cubical contents of the eye occasioned by the size of the vessel is sought by irritation, but a change in the lumen of the vessels to produce an increase or decrease in permeability of their walls and improvement from interchange of fluids. Dilated vessels signal the need of nutrition and permit the passage of immune substances that would otherwise have difficulty in entering the eye. The irritation, therefore, develops the natural defenses. These defenses may not differ from those of the skin, which have been well studied by Walsh, Cannon, Kahn, and others.

Chaulmoogra oil, its history, its chemistry, and its specificity for acid fast bacilli have been dealt with in previous papers.

The snuffling and hawking produced by chaulmoogra oil following its instillation into the nose are insufficient in cases of dacryocystitis to draw through the obstructed channel solutions from the conjunctival sac that would not otherwise pass.

In hyperplastic sphenoiditis, in which exophoria, headaches and moderate optic neuritis exist, snuffling and hawking has been noted to be helpful. This is equally true in cases of bronchiectasis in which sinusitis and central choroiditis exist.

In glaucoma, the beneficial effect is not from the simple physical activity of snuffling, which is not caused by abnormality of the nasal mucosa. This is equally true for iridocyclitis. There is benefit for the great pain of both diseases. Increased tension in such cases is not reduced promptly, but after repeated use, satisfaction may be obtained by this means.

In a series of five cases of retinitis pigmentosa, the oil used twice a day for a period of months, did not bring about any noticeable improvement. In interstitial keratitis, trachoma, and ulcer of the cornea, the effect of oil instilled

into the nose was most gratifying. The greatest benefit received was in cases suffering great ophthalmic pain whether it be from the cornea, iris or an ophthalmia.

CONCLUSION

Chaulmoogra oil when instilled into the nose, though an irritant which produces increased hyperemia of the mucosa, occasions a better nasal breathing, probably a Loven reflex. It is also beneficial to the eye even though the nasal channels are free of abnormality, probably a naso-ocular reflex. The benefit is believed due to excitation of the natural defenses of both organs.

DISCUSSION (*Abstract*)

Dr. W. H. Luedde, St. Louis, Mo.—Dr. Dimitry's paper presents a challenge to all physicians interested in ophthalmology and rhinology to study the reflexes between the nasal mucosa and the ocular blood supply. That such reflexes are present has been known since the researches of Berger reported in his These de Paris, 1890. It is of interest to note that Berger reported as Dr. Dimitry does in this presentation, that irritation of the nasal mucosa produced hyperemia of the conjunctival (superficial) vessels and constriction of the retinal (deeper) vessels. These reactions should be studied in the light of our growing knowledge of the autonomic nervous system and the control of capillary permeability through the innervation of blood vessels.

Thus the work of the late Dr. Greenfield Sluder, of St. Louis, on the effect of anesthesia of Meckel's ganglion on ocular neuralgias and on glaucoma may be carried to full fruition. But these things will not be done without careful clinical observations such as Dr. Dimitry has given us in this paper which is both important and timely.

PRIMARY HEMORRHAGE FROM THE ANTRUM HIGHMORE*

By A. L. Bass, M.D.
Louisville, Kentucky

Primary hemorrhage from the antrum highmore is exceedingly rare. After talking to a good many men of large experience and finding that they had not had any cases, I was surprised at the rarity; and after getting what literature there was to be had on the subject I was astonished. Of about twelve articles which I received in requesting literature relative to primary hemorrhage from the antrum, but two of them dealt directly with the subject. One was my own,[1] in which I reported my first case in 1927, before the Kentucky State Eye, Ear, Nose and Throat Section; and the other was an article by G. B. Trible,[2] of Washington, D. C., who reports five cases, three of his own and two by Wm. A. Morgan.

Briefly, his first case was an adult and was apparently of dental origin. It occurred on the right side, in which he had a diseased tooth removed and antrum opened. Case 2 was a woman about 50, with history of bleeding from the nose for several days. The right antrum was dark on transillumination. An old root of a tooth left from a previous extraction was removed and there was no further trouble. In the third case, a woman, hemorrhage followed tooth extraction. There was no opening from the socket into the antrum. He irrigated fresh blood and clots out of the antrum with no further trouble. Dr. Morgan's two cases were first, a boy, aged 12, who had sarcoma of the liver diagnosed at operation by biopsy. There was a hemorrhage from the left antrum which was dark on transillumination. The hemorrhage ceased after a few irrigations. The patient was given a blood transfusion. His second case, a woman aged 64, had a hemorrhage of several hours from the right nares. The right antrum was dark on transillumination. Irrigation revealed a large clot. The next day another large clot was irrigated and there was no further trouble.

F. T. Hyde,[3] in a report of a case of "Ligation of the External Carotid Artery for Control of Idiopathic Nasal Hemorrhage," says that the only source of bleeding which he could detect was an ulcerated area on the septum, superiorly. I suspect that this case may have been a hemorrhage from the antrum, which could only be ruled out by transillumination and x-ray. All of the other papers which I have read on the subject dealt with ligation of either the external or common carotid to control hemorrhage following trauma or postoperative.

My first case, a woman, Miss A. L., aged 43, came to the office November 29, 1926. Three days before coming to me she had a hemorrhage from the nose and was treated by another physician. She had no further trouble until that morning, when the nose started to bleed again. Previous to this epistaxis her health had been perfect; she said she had never had a physician that she could recall.

The hemorrhage was from the left side and rather active. Nasal inspection showed bright red blood coming from beneath the anterior tip of the left middle turbinate, and during normal expiration a fine spray could be seen just beneath the anterior tip of the middle turbinate. There was no bleeding point that I could discover otherwise. The patient's nose was packed with ½ inch 5 per cent iodoform gauze, filling the left nasal cavity with moderate pressure. She was to take a compound cathartic tablet that evening, magnesium sulphate the next morning, and 2 drams of an elixir of calcium chloride three times daily. That evening at 8:00 o'clock the patient's sister called me by 'phone and said that her sister's nose was bleeding again and had been bleeding for two hours. She was

*Read in Section on Ophthalmology and Otolaryngology, Southern Medical Association, Twenty-Ninth Annual Meeting, St. Louis, Missouri, November 19-22, 1935.

told to bring her sister to the office in thirty minutes. The fact that the hemorrhage came from the middle fossa made me think of the antrum. An x-ray examination of her sinuses that morning showed that the left antrum was cloudy. That evening when she returned to the office I found that the left antrum was dark on transillumination. Upon irrigating the antrum fresh blood appeared and between one and two drams of clotted blood. The irrigation was done with warm boric acid solution. The nose was repacked more completely and more firmly than that morning. The patient's sister called me by 'phone that same evening about 12 o'clock, saying that her sister's nose had been bleeding for about an hour. I could not understand how her nose could be bleeding much with the pack that I had put in it, and when I arrived at her house about 1:00 a. m. she informed me that it had stopped just prior to my arrival. I looked into the pharynx and saw there was no bleeding, then returned home, requesting her to report at the office that morning, when I irrigated her antrum to find blood, but not the bright red that it was about twelve hours before. I used a rather warm irrigation, thinking it would have some hemostatic effect. Her nose was repacked with cotton. That morning her clotting time was six minutes, hemoglobin 65 per cent, red cells were 3,320,000, white cells 10,800, and blood pressure 130/108. The Wassermann was negative. The next day, December 1, the antrum was irrigated. It was bloody, but not so fresh as the day before. The nose was repacked with cotton and the patient was told to skip a day before reporting at the office. The next evening at about 8 o'clock her sister called me and said that her sister's nose had been bleeding for about two hours. I requested her to meet me at the office again, where the antrum was irrigated with warm boric acid solution and the nose packed with cotton. She reported at the office the next morning and fresh blood persisted. I considered removing a good portion of the lateral wall and packing the antrum for about 24 to 48 hours, but decided to try a hemostatic thromboplastin first. After irrigating the antrum, I placed a pledget of cotton between the middle turbinate and lateral wall to block the ostium and filled the antrum with thromboplastin (for local use only). Then the opening beneath the inferior turbinate which was made by puncturing for irrigation was covered with cotton pledgets. The next morning when the antrum was irrigated there was no fresh blood and there had been no bleeding. The antrum was again filled with thromboplastin and the nose packed as before. The thromboplastin was used December 3 and 4, the fifth and sixth days after seeing her. She continued to report at the office on the fifth, sixth, seventh and eighth and tenth day for observation, without any further trouble. On January 16, 1927, six weeks after the initial trouble, another x-ray picture was made which showed the left antrum practically clear, but slightly cloudy compared to the right. On recent investigation I found that she had remained well until November 19, 1929, when she had a stroke early in the morning and died that evening.

Case 2.—A boy, L.N.W., aged 18, was seen November 22, 1927. For one or two years the left side of the nose had bled for a short time, then stopped for one or two month intervals. This morning at 2:00 o'clock the nose began to bleed and was stopped by Dr. H. at 8:00 in the morning by packing the left nares. Upon examination, the patient looked quite anemic; the left nares showed polypi in the middle meatus. The left antrum was dark on transillumination. X-ray report was that the left antrum and anterior ethmoid area were cloudy. When the antrum was punctured beneath the inferior turbinate, bright red blood came through the needle in a stream. The antrum was irrigated with warm normal saline, cotton was placed between the middle turbinate and lateral wall blocking the natural ostium, the antrum was filled with thromboplastin (local use), and cotton was placed beneath the inferior turbinate. Blood examination at that time showed: red cells, 1,890,000; Wassermann negative; clotting time 6 minutes; hemoglobin 60; white cells, 10,000; polynuclears, 76. Urinalysis was negative. The next day, November 23, blood again came through the needle in a stream when the needle was inserted into the antrum. The antrum was again irrigated with warm saline and filled with thromboplastin as on the day before. The patient was sent to the hospital and the same treatment repeated on November 24 and 25. On November 26 he was given a blood transfusion of 500 c. c. The next day, under general anesthesia, a Caldwell-Luc operation was performed. The antrum was nearly completely filled with degenerated polypoid mucosa. The antrum and anterior ethmoid area were packed with 5 per cent iodoform gauze, which was removed within 72 hours. The patient made a slow but uneventful recovery, having lost a great deal of blood.

Case 3.—F. W. W., aged 52, a man, was seen February 11, 1934, about 6:00 a. m. His previous health had been good. His nose began bleeding at 6:00 p. m., stopped after a few minutes, but started again about 4:30 a. m. The patient was examined in bed in a reclining position; a small stream of fresh blood was running down over the posterior border of the right inferior turbinate. After I applied 8 per cent cocaine solution and epinephrine to the middle fossa, wiping away the blood present, the bleeding ceased and no bleeding point could be found. The patient was given some antiseptic nose drops and told to report to the office the next day. His blood pressure at that time was 108/75 and clotting time 5 minutes. Urinalysis showed specific gravity 1.014 and a trace of bile. The right antrum was dark on transillumination. The patient was sent home to report back within a couple of days. I was called the next morning at 6:00 o'clock, when blood was coming from the same area rather freely. The right nares was packed and the patient sent to the hospital. X-ray was made with the following report: "Films show that the right maxillary sinus and the right ethmoid sinus are increased in density. The right maxillary contains very little air. The left maxillary sinus shows very slight increase in density, though it contains considerable air. The left ethmoids and left frontal cells are normally developed and normally aerated. On the lateral film the sphenoids are well developed and well aerated. On this film the upper posterior teeth and the posterior teeth of the lower jaw show evidence of extensive pyorrhea. Apparently one of the upper bicupsids has a large apical abscess. Dental films are indicated."

Blood count at that time was red cells 3,100,000, hemoglobin 55, white cells 16,000, polynuclears 68, Wassermann negative. That afternoon the right antrum was irrigated, producing some bright blood and a considerable amount of dark clotted blood. The antrum was filled with thromboplastin (for local use)

and cotton was placed over the natural ostium and beneath the inferior turbinate covering the needle puncture. The antrum was treated in like manner the next day. There was no further bleeding. Several badly abscessed teeth were removed within the next two weeks, which I believe were the primary source of the diseased antrum.

Case 4.—L. F. O., a man, aged 56, was first seen in the office March 13, 1935. He had had nose bleed six times within the preceding four days and epistaxis twelve years before. Upon examination at that time there was no bleeding, but the left antrum was dark on transillumination and was cloudy to x-ray. X-ray report was: "Films of the sinuses show the frontals to be well developed and clear. The sphenoids and posterior ethmoids are normal in density. The roof of the sphenoids is moderately dense and the inferior surface is slightly irregular. This may indicate that some hyperplastic changes are present, but there is no generalized increase in density. The anterior ethmoids are fairly well defined and no generalized increase in density is present. The right antrum is normal. There is a shadow along the lateral margin of the left antrum that projects inward a distance of approximately 6 cm. This is undoubtedly due to hyperplasia of the mucosa and it seems quite probable that polyps may be present as well."

Blood pressure was 180/100 and clotting time 8 minutes.

The left antrum was punctured with a needle beneath the inferior turbinate and bright blood plus large dark clots were irrigated out. Cotton was placed between the middle turbinate and lateral nasal wall; the antrum was filled with thromboplastin (for local use) and cotton was placed beneath the inferior turbinate. The next day the patient came to the office and bright blood came from the antrum with a good deal of activity. The antrum was again irrigated with warm normal saline solution and filled with thromboplastin. The patient was sent to the hospital. Blood count was: red cells, 4,040,000; white cells, 5,300; hemoglobin, 75 per cent; polynuclears, 66; staff cells, 5; lymphocytes, 30; mononuclears, 3. The Wassermann was negative. The next morning when I saw the patient at about 8:00 o'clock, I was told that he had bled from 9:00 to 10:00 p. m. and from 10:00 p. m. to 2:00 a. m., and he was bleeding at 9:00 a. m., when I saw him. I sent him to the operating room and did a Caldwell-Luc operation under local anesthesia. The antrum was nearly filled with degenerated polypoid mucosa. There was a small amount of bright red blood together with a small blood vessel filled with clotted blood over a millimeter in diameter at the natural orifice which I surmised to be the source of the hemorrhage. The antrum was cleaned out and packed with 5 per cent iodoform gauze. The packing was removed within 48 hours. Convalescence was uneventful.

CONCLUSION

Though primary hemorrhage from the antrum is rare, we should be on our guard to suspect it in order to save the patient as much trouble as possible. About 90+ per cent of hemorrhages from the nose are from Kiesselbach's area. I cannot help but believe that there have been more cases of primary hemorrhage from the antra. They have either not been reported or have gone unrecognized.

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DISCUSSION (*Abstract*)

Dr. T. Lyles Davis, Chattanooga, Tenn.—As Dr. Bass has said, primary hemorrhage of the antrum highmore must be rare, for a perusal of the recent literature reveals no information on the subject.

Two years ago, during the Christmas holidays, I had a case of this type. A man of 35, strong and healthy, and giving no history of previous nose bleed, was in the yard with children shooting fire crackers when a large cannon cracker exploded prematurely in his hand. Soon after the explosion, a rather profuse nose bleed began and a general practitioner was called, who packed the nose anteriorly.

Bleeding continued, in spite of nasal packs, for four days. It came from under the middle turbinate. The patient was given hemostatics and autohemotherapy. X-ray report showed that the right antrum was clouded. Intense pain and edema developed around the right eye. The patient was sent to the hospital for a Caldwell-Luc operation on the fourth day, but bleeding stopped as mysteriously as it began. The patient was kept under observation and it was fourteen days before the antrum was transilluminated clearly. I believe that hemorrhage in this case was due to concussion caused by explosion of a cannon cracker.

A CASE OF VOMITING OF THE ESOPHAGUS AFTER INJURY BY LYE*

By LAWRENCE LEE, M.D.
Savannah, Georgia

Miss R. C., aged 17 years, walked into the Telfair Hospital July 1, 1935, at 1:45 a. m. and said that she had swallowed a solution of lye or potash about 8:00 p. m. June 30.

Her temperature was 101°; pulse 88, weak and irregular; respirations were 20; and there was a slight degree of shock. The lips, tongue and throat were terribly burned and there was a white discoloration of the mucous membrane. When she attempted to swallow fluids, they came out of her nose. She had pain in the chest and spat up ropy saliva, tinged with blood, constantly. She was seen by Dr. Jones and also by Dr. Lang, a nose and throat specialist. About 10:00 a. m. she vomited dark brown fluid. Her temperature went to 102-103°; she had a cough; was very drowsy and slept most of the time without opiates. Saline was given intravenously, as she was unable to take water by

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mouth. On July 2 pain in the chest and mouth required doses of morphine.

On July 3, since the patient was unable to swallow any fluids, a gastrostomy was done and a No. 28 catheter sutured in the stomach. Glucose was given intravenously several times a day and given into the stomach by gastrostomy tube on and after July 4. She continued to spit up large quantities of blood-tinged stringy mucus and saliva and was nauseated. She took a small amount of cracked ice by mouth frequently. I was afraid to force a tube down the esophagus because any attempt seemed too painful and dangerous. She was in very little pain and 1/6 grain of morphine a day was sufficient.

After July 4 peptonized milk was given through the gastrostomy tube, raw eggs, milk, cereals, gruels and fruit juices. These caused no pain or nausea and were digested and assimilated. Cracked ice was given in as large pieces as possible by mouth to be swallowed, hoping that they would keep the esophagus open and act as a safe bougie, for if too large to pass they would soon melt and thus pass.

July 8, after two days of more difficult swallowing and efforts to vomit mucus and saliva, she vomited intact what was apparently the major portion of her esophagus: a membranous tube about 7 inches long and 1 inch in diameter (*Fig. 1*). This specimen was given to Dr. Howard, a pathologist, for examination and was considered by him to be the esophagus. The temperature continued around 101-103° until July 14, when it dropped to 100 and remained there until the day of her death (August 16) when it went to 105° plus. Pain also decreased and one-half to one grain of codein was all that was necessary and this was given at night to help her sleep, because the constant spitting and inability to swallow saliva disturbed her rest. After spitting up the esophagus she became unable to swallow water or ice. Any effort was followed immediately by gagging and spitting up of ropy saliva and mucus.

There was no pain in the abdomen after feeding through the gastrostomy tube and as much nourishment as 50 ounces of gruel, 30 ounces of peptonized milk and 16 ounces of fruit juices, and several raw eggs were given daily.

After July 20 she was able to be out of bed a short time each day. July 27 she began to be nauseated after feeding and complained of pain. Stomach lavage was tried through the gastrostomy tube before feeding, but the lavage caused as much pain as the introduction of food. Her suffering became pitiful and was not relieved by large doses of opiates. It was impossible to give her sufficient food.

July 28 she began to have choking sensations after feeding, which became worse and worse. X-ray examination was attempted to see whether anything passed from the mouth to the stomach. The barium was vomited immediately, but from the fluoroscope some of it appeared to enter her trachea.

The lining of the stomach was examined with a cystoscope through the gastrostomy wound, but nothing abnormal was seen.

August 12 she began to have violent twitching of the muscles of the body; also severe dyspnea. Her suffering from dyspnea was so great that during the last twelve hours of her life she was kept under tetrabromethyl alcohol anesthesia. Morphine, by depressing respiration, made the condition worse. She died (August 16) from terminal pneumonia.

Dr. G. H. Faggart, who examined her on August 14, reported:

"The patient had considerable edema of the lungs, which was evident on inspection, and breathing was laborious.

"Laryngeal examination by the indirect method revealed an edematous distorted pharyngeal wall and the larynx appeared much like a cervix uteri, only smaller, the epiglottis having sloughed away. The vocal chords were not discernible and the interior of the larynx appeared much constricted. On August 16 the respiration became more embarrassed and direct laryngoscopic examination was attempted, but was unsuccessful, as the patient could not breathe at all with the head extended. An attempt was made to dilate the strictured larynx with a medium sized Mosher life saver. This was unsuccessful on account of the inflammatory swelling and the firmness of the scar tissue.

Our impression is that the pain probably was not caused by a mediastinitis, as it would have been continuous and accompanied by higher fever than 99 to 100°. Laryngoscopic examination by Drs. Maner and Faggart showed complete destruction of the epiglottis and destruction and distortion of the larynx; when the patient was fed, a flow of saliva was stimulated which ran into the bronchi and trachea, causing paroxysms of coughing, nausea and pain. A few days before death the opening in the larynx became so small that there was constant dyspnea. At first elevation of the foot of the bed gave relief, as saliva did not enter the trachea freely, but ultimately the opening in the larynx became so small that she was unable to get sufficient air. Oxygen gave relief for a short time, but contraction continued and attempted intuba-

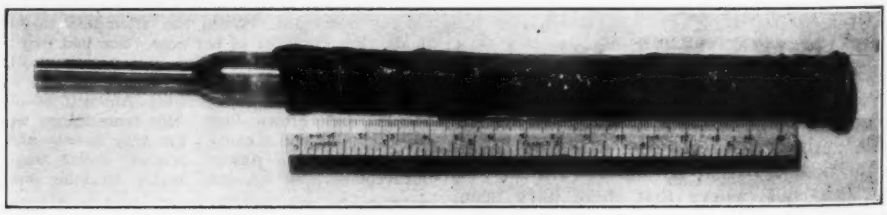

Fig. 1

tion was unsuccessful. Tracheotomy would have been of only transitory relief, for saliva would have continued to run down the trachea past the tube, pneumonia would probably have set in, and the spells of coughing and pain would have continued.

This is the only case that I know of in which the esophagus was lost as an intact tube, and I report it for this reason.

DeRenne Apartments

BRAIN TUMORS IN CHILDREN*

By J. G. LYERLY, M.D., F.A.C.S.
Jacksonville, Florida

Brain tumors in children may differ from those in adults in both type and situation. The encapsulated tumors as meningiomas, acoustic neuromas and pituitary adenomas are found almost exclusively in adults. In children the glioma group, congenital tumors, and an occasional tuberculoma are most frequently encountered.

In 1927 from a series of 1,108 cases of brain tumor Cushing[1] reported 154 in pre-adolescence. There were 75 per cent in the glioma group and 13.6 per cent of congenital tumors, mostly suprasellar cysts. In all his cases of verified brain tumor[2] the gliomas composed 42.6 per cent.

Leavitt,[3] in 1929, reported 23 brain tumors in children in a series of 350 cases, giving a proportion of 1 to 14 of children to adults. In Cushing's series the frequency was about 1 to 7.

Although the majority of tumors are gliomas in children, they are not all hopelessly malignant. Bailey and Cushing[4] have classified gliomas according to the pathological structure and found that some were malignant with a short clinical course, while others were relatively benign and gave symptoms over a longer period of time. Cushing[1] states there is a 2 to 1 chance of finding a favorable type of glioma at operation in the midcerebellar region of a child.

Some older text-books state that tuberculoma is the most frequent type of brain tumor in children. Starr,[5] in 1888, reported 50 per cent of tuberculomas in 308 cases under 18 years of age. This is probably due to the prevalence of tuberculosis at that time. Van Wagenen,[6] in 1927, reported only 14 cases of tuberculoma in a series of one thousand verified brain tumors from Cushing's clinic, giving a percentage of 1.4. Bailey,[7] in his book on intracranial tumors, states that tuberculoma represents less than one-tenth of all brain tumors in children.

*Read in Section on Pediatrics, Southern Medical Association, Twenty-Ninth Annual Meeting, St. Louis, Missouri, November 19-22, 1935.

PATHOLOGICAL TYPES

The common types of glioma in children are: medulloblastoma, astrocytoma, spongioblastoma, and ependymoma. Most of them take their origin from the medullary plate in the roof of the fourth ventricle, where there may exist remnants of primitive epithelium. The type of tumor is determined by the stage of differentiation the cells have undergone in their evolution and development.

The cerebellum is the most frequent location for these tumors. Cushing[1] found the proportion of cerebellar to cerebral tumors to be 2 to 1, while in adults it was 1 to 5.

The medulloblastoma is one of the most malignant of the gliomas in the midcerebellar region. It is composed of undifferentiated cells called medulloblasts which have a large nucleus with a small ring of cytoplasm. This tumor is rapidly growing and has a short clinical history before coming for treatment.

The astrocytoma is the most frequent type and is relatively benign. The histological structure is made up chiefly of astrocytes defined as differentiated, large spider-shaped cells with numerous processes. The tumor contains a cystic cavity filled with xanthochromic fluid which is the product of a nodule of solid tumor in the wall. It is most frequently found in the midcerebellar region in children, while in adults it is equally common in the cerebrum. The symptoms are of longer duration than is the case with medulloblastoma.

The spongioblastoma polare is composed of cells with long processes extending from one or both poles, known as uni- or bi-polar spongioblasts. Bailey and Eisenhardt[8] found that this tumor frequently involved the optic chiasm and next in order the cerebellum and brain stem. It is a slow-growing tumor and would be favorable for surgical removal except for its unsuitable location. In the cerebellum it may be cystic, containing a mural nodule like the astrocytoma. In this case the nodule of tumor can be removed and the patient may be given a favorable prognosis.

The ependymoma may take its origin from the roof plate of the fourth ventricle or from

the ependymal lining of the ventricles. The tumor is a solid growth, filling the fourth ventricle and frequently sending a prolongation through the foramen magnum into the spinal canal. It appears encapsulated, but its intimate association with vital structures and the walls of the ventricle renders it unfavorable for complete removal. The patient's life is greatly prolonged by partial removal and decompression offered by the operation.

The most frequent congenital tumor in children is the craniopharyngioma, or Rathke's pouch cyst. It takes its origin from misplaced epithelial cells about the pituitary stalk growing in from the pharyngeal recess in the embryonal development. It is composed of masses of epithelial cells, with a row of columnar type around the periphery and a fibrous tissue stroma. One or more cystic cavities may be found in addition to the solid tumor. It is encapsulated and frequently shows calcification on x-ray examination in or above the sella turcica. The growth is slow, but the pressure symptoms may come suddenly in childhood or later in adult life. Direct pressure on the optic chiasm will produce a primary optic atrophy. There may be stunting of body growth and retarded sexual development from involvement of the pituitary gland. Upward extension disturbs the function of the hypothalmic region, causing polydipsia and polyuria. It later fills the third ventricle and causes an obstructive internal hydrocephalus with choked discs and general pressure symptoms.

SYMPTOMS AND DIAGNOSIS

The frequent location of the tumor in the midcerebellar region causes early blockage of the ventricular drainage and therefore pressure symptoms may be the first to appear. Early morning vomiting is one of the most frequent symptoms. It is sudden and forceful without nausea, and the patient may eat a full meal afterwards. These patients often have had gastrointestinal x-rays and have been treated for various conditions, including appendectomy, for a presumed appendicitis.

Headache is a rare symptom in children. It may occur early in the morning and has little significance as a localizing sign. An enlargement of the head can sometimes be demonstrated and the scalp veins usually stand out in the frontal and temporal regions with increased pressure. Macewen's sign or a "cracked pot" sound may be found on percussion of the skull when there is thinning of the vault and a separation of the sutures. This, together with an erosion of the dorsum sellae, constitutes the x-ray evidence of general pressure. As brought out by Gross,[9] the predominating symptom of brain tumor in the very young child is a rapidly enlarging head as in hydrocephalus. Tilting of the head to one side in cerebellar tumor, according to Sachs,[10] was Horsley's idea of involvement of the superior cerebellar peduncle.

A staggering gait and awkwardness in the use of a hand or foot is sometimes a complaint in cerebellar tumor. With involvement of the vermis the trunk movements rather than the extremities will be affected. Lateral lobe lesions produce homolateral ataxia and adiadokokinesia with nystagmus most pronounced to the side of the lesion.

Failing vision is a common complaint which carries the patient to an oculist for glasses. Unless the specialist looks at the eye grounds the cause of the impaired vision may not be found. The failure of the clinician to examine the eye grounds is one of the chief causes of error in the diagnosis. A choked disc usually leads to a correct diagnosis, but often it is not discovered until there has been permanent impairment of vision or complete blindness.

DIFFERENTIAL DIAGNOSIS

The differential diagnosis of brain tumor in children should be made from brain abscess, chronic subdural hematoma, idiopathic hydrocephalus, chronic arachnoiditis, encephalitis, and tuberculous meningitis. Superficially one may have to exclude so-called acidosis, intestinal parasites, appendicitis, chronically infected tonsils, astigmatism and refractive errors, but their confusion is most apt to arise from an inadequate history and examination with misinterpretation.

Brain abscess in children is rare and when present is associated with an infection about the head, thoracic cavity or elsewhere in the body. In chronic subdural hematoma there is a history of head injury several weeks or months before, usually of a mild character. The pressure symptoms come on gradually with progressive enlargement of the encysted clot. In infants the hemorrhage may occur from birth injury with gradual enlargement of the head, suggesting a hydrocephalus. The diagnosis is made by aspiration of the subdural space through the lateral margin of the fontanel or through a small trephine opening in the skull. Idiopathic hydrocephalus may be excluded by combined

punctures, dye injection, ventricular estimation and sometimes by air injection. Chronic arachnoiditis and mechanical blockage of fluid from the ventricles by adhesions may be indicated by the absence of localizing signs, but it may not be diagnosed until operation when the adhesions are broken up. Encephalitis is sometimes confusing, especially when there are focal signs, but a low grade fever and the absence of choked discs should suggest the diagnosis. A ventriculography may be required to make an accurate diagnosis. Tuberculous meningitis is usually associated with tuberculosis elsewhere in the body. The symptoms are of short duration without choked discs and the spinal fluid findings are characteristic. A spinal puncture is extremely dangerous and should not be employed when cerebellar tumor is the probable diagnosis, especially when there is choked disc, for fear of herniation of the cerebellum and medulla into the foramen magnum, resulting in a fatality.

Treatment.—The treatment of brain tumors in children is primarily surgical. Occasionally a case will be inoperable because of the nature of the growth and the unfavorable location in the pons and brain stem, when deep x-ray treatment will be indicated. However, most cases can be greatly benefited and some probably cured by surgery, while others require in addition x-ray treatment.

CASE REPORTS

Case 1.—J. C., a white boy, aged 8, was admitted to St. Vincent's Hospital October 9, 1934, being referred by Dr. L. W. Holloway, of the pediatric service.

The complaint was of vomiting, loss of weight, staggering gait and failing vision.

The patient had been feeling badly for eight months and making poor progress in school. Four months previously he started vomiting early in the morning, and this symptom was soon followed by a staggering gait. He vomited without nausea and had occasional headache. He had complained of blurred vision for the previous month and rapid loss of vision in the preceding several days.

Neurological Examination.—The patient was extremely emaciated. The head showed a "cracked pot" sound on percussion over both sides.

Cranial Nerves.—There were bilateral choked discs of four diopters. Vision was reduced in both eyes to seeing moving objects. The tongue protruded slightly to the right. There was a little lateral nystagmus to both sides.

The lobes of the brain were normal, except for bilateral ataxia of the upper and lower extremities. The patient stood with feet far apart and with a tendency to fall backward. He staggered to both sides.

Examination of the reflexes showed that the tendon jerks were sluggish. There was a positive Babinski on both sides.

The diagnosis was midline cerebellar tumor, probably a medulloblastoma.

At operation, October 11, 1934, bilateral cerebellar exploration under local and ether anesthesia showed a tremendous increase in pressure, relieved partly by tapping the enlarged lateral ventricle. There was some herniation of the cerebellar tonsil into the foramen magnum, which was relieved without resection of the arch of the atlas. The right cerebellar lobe appeared fuller than the left. An incision through the right lobe near the midline showed a vascular, soft tumor at a depth of 3 cm. A small amount of the tumor was removed and the wound closed.

The pathological diagnosis was medulloblastoma (Dr. Lucien Dyrenforth).

The patient made an uneventful recovery from the operation. Roentgen irradiation was recommended and the patient discharged to his home 18 days after the operation.

This patient's symptoms date back eight months, although the general pressure probably had existed for four months. He was in the advanced stage of pressure with almost complete blindness. The classical symptoms of early morning vomiting, staggering gait and choked discs, all of recent origin, are suggestive of the nature and location of the lesion. The operative treatment is usually limited to a partial removal of the growth and a decompression. Of the gliomas this is the most amenable type for x-ray treatment, which should be started as soon as possible after the operation. The life expectancy after operation and x-ray treatment is from six to eighteen months, although Cushing[8] reports a case living five years

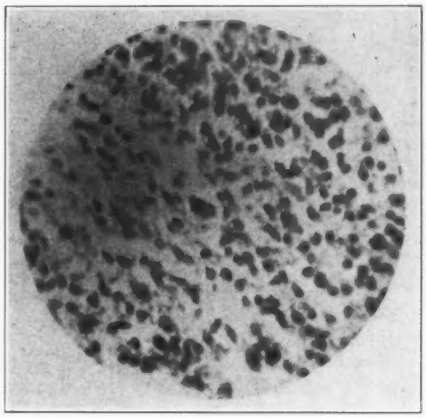

Fig. 1

Medulloblastoma showing rounded and carrot-shaped cells with scanty cytoplasm. Courtesy of Dr. Lucien Dyrenforth.

Fig. 2
Case 2. Astrocytoma of cerebellum showing astrocytes in tumor removed at operation.

and Rand[9] one seven years after this plan of treatment.

Case 2.—G. P., a white boy, aged 10, was admitted to Memorial Hospital, Richmond, Virginia, February 6, 1934, referred by Dr. F. W. Gainey, of Fayetteville, North Carolina, and Dr. C. M. Caravati, of Richmond, Virginia.

He complained of headache, vomiting, and staggering gait.

One and a half years previously the patient began suffering with generalized headache. In September, 1932, soon after the beginning of these headaches, his tonsils were removed, since it was hoped that this might give relief. The patient had a fall of 14 feet six months previously, following which he was unconscious for a few minutes. Otherwise there were no unusual symptoms. For the preceding several months the headaches had been located in the occipital and frontal regions. He had had early morning vomiting for the previous two weeks and staggering from side to side. There were stiffness of the neck and continuous headache for the past week.

Neurological Examination.—The patient was a fairly well nourished boy, lying on his side in acute pain, complaining of severe headache.

His head was normal in size and shape and tilted to the left. His neck was rigid.

Cranial Nerves.—There were bilateral choked discs of two diopters. He complained of diplopia, but the extraocular movements were normal. There was horizontal nystagmus with coarser element to the left. The tongue protruded slightly to the left. There was questionable right lower facial weakness.

Functions of the lobes of the brain were normal except for ataxia of both upper and lower extremities, more pronounced on the left. Unsteady station and gait were noted with tendency to fall to the left.

Examination of the reflexes showed tendon jerks sluggish in the upper extremities, hyperactive and equal in the lower; a positive Babinski on the left and Oppenheim on the right.

The diagnosis was cerebellar tumor midline, extending into the left lobe, probable astrocytoma.

At operation, February 6, 1934, bilateral cerebellar exploration was done. Ventricular estimation showed internal hydrocephalus with obstruction pointing to the posterior fossa. The left cerebellar lobe was swollen with the midline structures displaced to the right. The left cerebellar tonsil was herniated into the spinal canal as far as the atlas.

At a depth of 3 cm. a cystic cavity in the left lobe was encountered containing over two ounces of xanthochromic fluid, which clotted on standing. Incision into the cyst disclosed a solid tumor in its mesial wall in the region of the vermis. The tumor was removed by blunt dissection and the electrosurgical knife.

The pathological diagnosis was astrocytoma (Dr. Lewis Pusch).

The patient had considerable elevation of temperature in the first 24 hours, which gradually subsided. There was an accumulation of fluid in the cystic cavity requiring aspiration and drainage. Examination of the

Fig. 3
Case 2. Photograph, August, 1934.

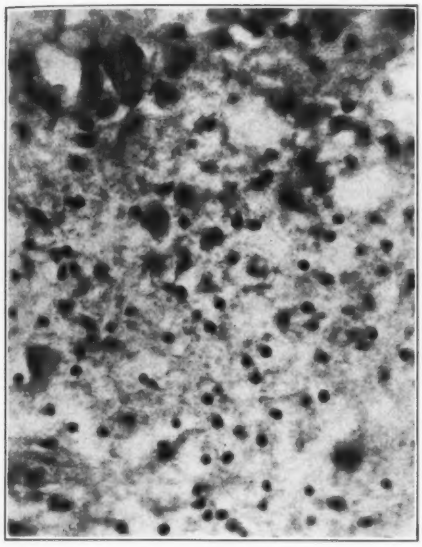

Fig. 4

Case 3. Astrocytoma of cerebellum showing scattered astrocytes in tissue from wall of cyst. A multinucleated cell is included in the field.

fluid showed it to be sterile. Otherwise the patient made a good postoperative recovery and was discharged from the hospital 27 days after the operation. The last communication from his mother on August 9, 1935, said that he was well and had no complaints.

The nature of this tumor was suspected from the long duration of symptoms. This is a slow growing tumor and a long period of relief if not a cure should be obtained from operative removal. There is no epithelial lining in the cyst wall and it is necessary only to remove the nodule of tumor to effect a cure. X-ray treatment has no effect upon this type of growth.

Case 3.—J. L., a white girl, aged 4, was admitted to St. Vincent's Hospital January 31, 1935, referred by Drs. Ralph Greene and L. W. Holloway.

Staggering was first noticed a month before and a jerky movement of both hands. This awkwardness was worse in the right arm and leg, but both sides were affected. She complained of slight pain in the right side of the head. She had vomited once three weeks before.

Neurological Examination.—The patient was well developed and nourished.

The head was negative.

Cranial Nerves.—The eye grounds were negative. There was slight horizontal nystagmus, questionable weakness of the right lower face, and the tongue protruded slightly to the right.

The lobes of the brain were essentially negative except for ataxia of both upper and lower extremities, more pronounced on the right side. The patient stood with a broad base and staggered to both sides, but more to the right.

Examination of the reflexes showed tendon jerks of the upper extremities, normal. In the lower extremities they were sluggish and equal. There were no pathological reflexes.

The impression was probable midline cerebellar tumor. The short duration of symptoms suggested a medulloblastoma. Because of the absence of choked discs a ventriculography was recommended as a preliminary procedure to a cerebellar exploration to confirm the diagnosis.

Ventriculography was done February 1, 1935. This confirmed the diagnosis as shown by the symmetrically dilated and communicating lateral and third ventricles.

Operation consisted of bilateral cerebellar exploration. There was no herniation of the cerebellum nor obliteration of the cisterna magna. The cerebellar lobes were symmetrical. The foramen of Magendi was enlarged and the fourth ventricle examined. A bulging mass one inch in diameter was seen projecting down from the roof of the ventricle. This mass was fluctuating and on aspiration contained xanthochromic fluid. The cyst was then opened and a soft, grayish tumor was removed from its wall. The wound was closed in the usual manner.

The pathological diagnosis was astrocytoma (Dr. C. C. Royce and Dr. Louise Eisenhardt).

The patient made a good postoperative recovery. The wound required reopening to repair the muscles whose sutures pulled loose, and she was discharged from the hospital on March 24, 1935.

Fig. 5

Case 3. Photograph September, 1935, showing some fullness in suboccipital region.

In June she developed whooping cough, from which she recovered without any ill effects. She was free of headache and general pressure symptoms until October 6, 1935, when she returned because of headache and vomiting and staggering station and gait. She was readmitted to the hospital for probable recurrence of the growth.

The second operation was done October 9, 1935, under avertin and local anesthesia, and the old cerebellar wound was opened. The deep-seated tumor in the midcerebellar region was exposed and was found to be about 6 cm. in diameter. The tumor involved the brachium conjunctivum and the roof of the aqueduct. It was removed completely in small pieces.

The patient stood the operation very well, but there was slight shock at the end. By the administration of fluids and tr[illegible]t for shock there was improvement, but she succu[illegible]n hours later.

This was a[illegible] when the patient first appeared for operati[illegible]s deep-seated and almost inaccessible site and without the information of its true pathological nature, the conservative plan of partial removal seemed to be the best at the time. With the symptoms of recurrence eight months later and the knowledge that it was a favorable type for surgical removal one was encouraged to proceed radically in the hope of obtaining a cure. The close association with vital structures made its removal hazardous and it proved to be too much for the patient.

Fig. 6
Case 4. Roentgenogram of skull showing convolutional atrophy, separated sutures and erosion of dorsum sellae. X-ray by Dr. O. O. Feaster.

Case 4.—E. W., a white girl, aged 9, referred by by Dr. LeRoy Wylie, of St. Petersburg, Florida. She was admitted to St. Vincent's Hospital February 24, 1935.

The chief complaint was of headache, vomiting, impaired vision and staggering gait.

The present illness began two years previously with vomiting early in the morning, followed by headache, getting progressively worse. Impaired vision was noticed ten days before, worse in the left eye. She had been having unsteadiness of station and gait for the previous three months.

Fig. 7
Case 4. Photograph of nodule of tumor in cyst wall removed at operation.

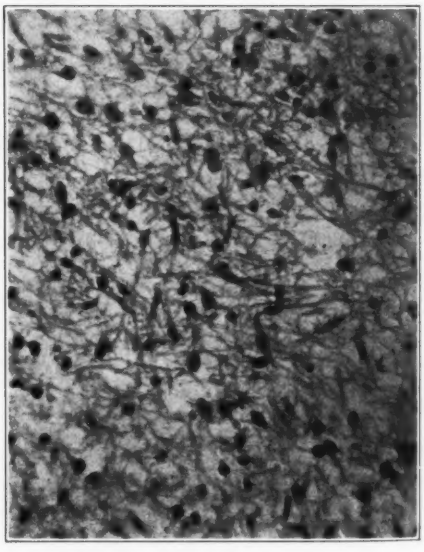

Fig. 8
Case 4. Spongioblastoma of cerebellum showing unipolar and bipolar cells, many with corkscrew-like processes.

Fig. 9
Case 4. Photograph September, 1935, after removal of cerebellar spongioblastoma.

Neurological Examination.—The head showed the "cracked pot" sound on percussion. The veins of the scalp in the frontal and temporal regions were dilated.

Cranial Nerves.—There were bilateral choked discs, four diopters on the left and two on the right. Secondary optic atrophy was noticed, more on the left. Vision of the left eye was reduced to counting fingers at two feet; right eye, 10/30.

Lobes of the Brain.—There was bilateral ataxia of the upper and lower extremities with moderate adiadokokinesia. She stood with a broad base; there was a staggering gait to both sides, and horizontal nystagmus.

X-ray of the skull by Dr. O. O. Feaster showed convolutional atrophy, separated sutures, and erosion of the dorsum sellae.

The diagnosis was midline cerebellar tumor, probably astrocytoma.

Operation February 15, 1935, consisted of cerebellar exploration in the usual manner. A midline subcortical cystic tumor was encountered at a depth of 2 cm., extending into the left lobe. The cystic cavity held about four ounces of xanthochromic fluid and there was a mural nodule of tumor 1½ inches in diameter deep in the mesial lobe. Only a thin membrane separated the cyst from the fourth ventricle. The mural nodule was completely removed.

The pathological diagnosis was spongioblastoma polare (Dr. C. C. Royce and Dr. Louise Eisenhardt).

The patient made an excellent postoperative recovery. Deep x ray therapy was given by Drs. L. W. Cunningham and W. M. Shaw, after which the patient was discharged to her home in New York. The last communication from her mother on September 10 stated that she had remained in perfect health and was gaining weight. There were no symptoms except the impaired vision in the left eye and a 20/50 in the right, which has been stationary.

This is not a frequent type of tumor in this site and the gross appearance of it was that of an astrocytoma. Apparently from the cases reported in the literature with complete removal of the nodule the prognosis is favorable as with astrocytoma. Postoperative deep roentgen therapy was recommended as a precautionary measure. It is unfortunate that this patient's vision was much impaired before the operation.

Case 5.—J. H., a white girl, aged 5, was referred to the Johnson-Willis Hospital, Richmond, Virginia, on October 23, 1933, by Dr. J. N. Williams.

Her chief complaints were headache, vomiting, drowsiness, fever, polyuria and polydipsia.

The patient had had polyuria, polydipsia and bed wetting since 18 months of age. Eight months previously she began having early morning headache and vomiting with constipation. At the same time she began having staggering gait and impairment of vision. She complained of abdominal pains when there was vomiting. She was first seen by me on June 23, 1933, when I was associated with Dr. C. C. Coleman in Richmond. At this time the patient was found in coma with bilateral spasticity and opisthotonus, suggesting decerebrate rigidity. The head showed a "cracked pot" sound on percussion, and there were bilateral choked discs with secondary optic atrophy. The temperature was 105° rectally. X-ray examination of the skull by Drs. D. D. Talley and L. W. Whitehead showed suprasellar and intrasellar calcification with convolutional atrophy of the vault and separated sutures.

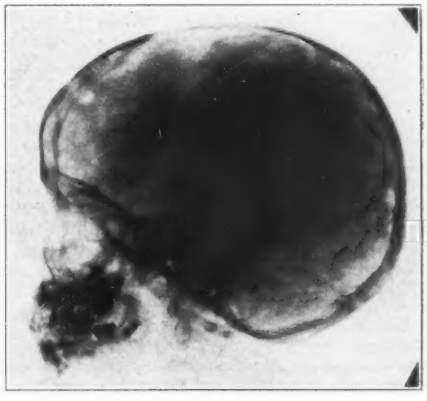

Fig. 10
Case 5. Roentgenogram of skull showing convo'utional atrophy and intra- and suprasellar calcification. X-ray by Dr. L. W. Whitehead.

Fig. 11

Case 5. Craniopharyngioma, showing masses of epithelial cells with peripheral row of columnar type and cystic areas.

Immediate ventricular punctures and aspiration of the suprasellar cyst were done. After this the patient regained consciousness and was soon able to be up. The improvement continued until a few days before I saw her, when there again appeared headache, vomiting and fever.

Neurological Examination.—The patient was of small size and underdeveloped for her age.

The head was large for her body and gave a "cracked pot" sound on percussion.

The cranial nerves were normal except for bilateral secondary optic atrophy from old choked discs, and visual impairment in the right eye with inability to recognize a knife and a key, although she could read ordinary sized letters with the left.

Lobes of the Brain.—There were bilateral ataxia and tremors with spasticity of both upper and lower extremities. The station and gait showed unsteadiness and staggering.

There were hyperactive tendon jerks with bilateral Babinski phenomena. The urine had a low specific gravity.

At operation, October 25, 1933, a right frontal osteoplastic flap was made, and the suprasellar region was explored from beneath the right frontal lobe. The optic chiasm and nerves were lifted upward and forward by the tumor which was located above, below and behind. An incision was made in the capsule above and below the chiasm and the contents of the tumor were removed with a curet. The capsule was not completely removed.

The patient made a good recovery except for a cold and otitis media which developed a week after operation. From this she recovered and was discharged from the hospital on December 30, 1933.

The pathological diagnosis was cranio-pharyngioma (Dr. W. A. Sheppard).

She was readmitted June 23, 1934. The patient had been well since operation until four days previously, when she began having headache, vomiting, and pain in the abdomen. For several days had been weak and unsteady in both legs with inability to walk. There was no change in vision. Polyuria and polydipsia had been better since the last operation.

Examination showed that the patient was drowsy with the same neurological findings as recorded on October 23, 1933.

At operation, June 29, 1934, the old right frontal flap was turned down and a dural flap made. A partial resection of the right prefrontal area was done into the lateral ventricle. A large cyst above the third ventricle was found, the thin membrane of which was ruptured and the chocolate fluid removed with suction. The solid tumor below in the third ventricle was removed in pieces. Part of the capsule was left. The wound was closed in the usual manner, and the patient made a good postoperative recovery.

The last examination in the office on September 22, 1934, showed the absence of pressure symptoms and walking without difficulty. There was some impairment of vision.

The last communication from her physician on August 8, 1935, indicated some return of pressure symptoms. Nothing further in operative treatment was recommended.

Fig. 12

Case 5. Photograph January, 1934, showing scar mostly concealed for low frontal flap used for exploration of pituitary region from beneath the frontal lobe.

This is a typical case of pharyngioma with suprasellar cyst showing calcification on x-ray examination and presenting symptoms of disturbed function in the region of the floor of the third ventricle. One is tempted to attack these lesions radically, but the complete removal of the capsule in contact with the circle of Willis, optic chiasm and the hypothalmic region makes it a hazardous procedure. A conservative plan of treatment as adopted in this case is believed to give the longest period of relief from pressure symptoms, at the same time preserving the vision.

CONCLUSIONS

(1) Brain tumors in children are probably more common than is generally recognized. The symptoms frequently assimilate other diseases, and the diagnosis may not be made until too late to help the patient and prevent blindness.

(2) Unexplained vomiting, headache and symptoms of enlargement of the head should require a careful eye ground study and neurological and x-ray examinations to rule out a brain tumor. The finding of a choked disc should always indicate a brain tumor until proven otherwise.

(3) While the majority of brain tumors in children are gliomas, most of them have relatively a low grade of malignancy and can be handled favorably with modern methods of neurosurgical treatment. Deep x-ray treatment should be given to the medulloblastomas irradiating the whole cerebrospinal axis.

(4) A tumor in the third ventricle region as the craniopharyngioma produces hypothalmic symptoms, obstructive internal hydrocephalus, hypopituitary signs and impaired vision from chiasmal involvement.

(5) Case reports are made illustrating the common pathological types: medulloblastoma, astrocytoma, and spongioblastoma polare of the glioma group, and craniopharyngioma of the congenital tumors.*

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404 Medical Arts Building

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DISCUSSION (*Abstract*)

Dr. Lyerly (closing).—A convulsion is not a frequent finding in brain tumor in children, since the usual location is in the cerebellar region. Should the tumor involve the cerebrum, especially in the region of the motor cortex, convulsions especially of the Jacksonian type may be a prominent feature. As was stated in the paper, cerebellar lesions sometimes produce tonic extensor rigidity as seen in cerebellar fits, which, however, are not true epileptic convulsions.

The symptoms I wish to emphasize are early morning vomiting and headache with sometimes a history of enlargement of the head which should suggest an intracranial lesion if other considerations can be ruled out. The routine use of the ophthalmoscope is also important, since a choked disc cannot be determined by any other means. A choked disc is always diagnostic of brain tumor until proven otherwise.

THE TREATMENT OF ACUTELY PERFORATED DUODENAL ULCER BY EXCISION WITH PYLOROPLASTY*

WITH A REPORT OF FOURTEEN CASES TREATED BY THIS METHOD

By J. M. Donald, M.D.
Birmingham, Alabama

Every physician familiar with acute perforation of a peptic ulcer is in unanimous agreement that this complication demands immediate operation. The greatest factor in the mortality rate of this condition is the time elapsing between perforation and operation. It is estimated that 10 to 20 per cent of duodenal ulcers perforate.[1] A great majority of acute perforations are treated by simple closure alone or in conjunction with a gastro-enterostomy. The present mortality is approximately 25 per cent. Fleming,[2] in 1931, collected 994 cases from the literature with a gross mortality of 23.6 per cent. Blackford and Baker,[3] in the same year, collect-

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*From the Section of Surgery, Division A, Hillman Hospital.

ed 954 cases, including their own series, with a mortality of 22 per cent. One gathers from these figures that in spite of the great advances made in surgery of the stomach and duodenum, the mortality rate following operations for acute perforation remains appallingly high.

In addition to the time element, there are other definite factors contributing to this high mortality. Prophylaxis should receive especial consideration in dealing with acute perforation. In spite of the oft-repeated statement that patients with acute perforation have had no previous gastric symptoms, my own experience and that of others demonstrate that the majority of patients suffering from acute perforation have had definite previous gastric disturbance which would suggest peptic ulcer. Thus in a review of the literature on this subject comprising fourteen articles,[15 16 18 26 27 28 29 30 31] 85 per cent of the cases gave previous histories of gastric disturbance, most of these being typical ulcer histories. In my own experience of 38 cases, only one failed to give a previous history to suggest ulcer. The explanation for the prevalent belief that patients with perforated ulcers usually have had no previous gastric disturbance seems to be that the histories are frequently obtained while the patients are suffering agonizing pain and are incapable of giving an accurate history. Blackford and Baker[3] stated that they had never known an ulcer to perforate in a patient in whom a previous diagnosis had been made and who had been given treatment. They further said that any reasonable medical care is excellent assurance against perforation. Hinton,[4] on the other hand, reported six perforations occurring out of 215 ulcer patients under observation. Perforation should be looked upon as due to neglect on the part of the patient or the doctor. In the Hillman Hospital, which is a charitable institution, the majority of ulcers which come to surgery are complicated by perforation. While we have no control over the patient who refuses medical care, it is the responsibility of the physician to diagnose those cases coming under his supervision and to determine which ulcer is surgical and which is medical. A patient with a penetrating ulcer usually gives a history of pain more severe than is seen in the ordinary type of ulcer. The fluoroscopic examination might also detect the penetrating type of ulcer. These patients should be urged to have an operation before perforation ensues.

Another factor contributing to the mortality rate in acute perforation is the occasional error in diagnosis. The symptoms and signs are so typical in most cases that there is no difficulty in arriving at a correct diagnosis. However, in the occasional case the symptoms point to the appendix as being the offending organ. This picture usually occurs in the pin point perforation with slow leakage, resulting in less severe symptoms. The gastroduodenal secretions gravitate to the lower right abdominal quadrant, producing pain over the appendix. The writer has encountered 4 such cases in which exploration of the appendix did not reveal sufficient inflammation to account for the free peritoneal fluid, further exploration revealing a pin point perforation of duodenal ulcer. This type of case might easily be overlooked and treated only for appendicitis.

Roentgenology has taught us that duodenal ulcer in this country occurs approximately ten times more frequently than gastric ulcer. An ulcer on the gastric side is usually located on the lesser curvature. A true pyloric ulcer is rare indeed. It usually means that a duodenal or gastric ulcer, more often the former, has encroached on the pyloric ring. I mention these facts because frequently there is no attempt made to determine the exact location of an ulcer and many duodenal ulcers are evidently referred to in the literature as pyloric or gastric ulcers.

The more common operative procedures in use at the present time for acutely perforated duodenal ulcer may be listed in order of their popularity under four headings:

(1) Simple closure, either by Lembert or purse string suture
(2) Simple closure plus gastroenterostomy
(3) Excision with pyloroplasty
(4) Subtotal gastrectomy

Simple closure was first used successfully by Kriege[5] in 1892. This remained the standard treatment for acute perforation until Braun[5] in 1897 introduced gastro-enterostomy in addition to simple closure. Moynihan[6] and the late Dr. Deaver[7] were great champions of the latter procedure.

Advocates of simple closure feel that acute perforation is a catastrophe of such magnitude as seriously to threaten the life of the patient and the least possible amount of operative interference necessary to close the perforation is preferred. They claim that simple closure effects a cure in a large percentage of cases and that gastro-enterostomy is unnecessary as a curative measure. They also claim that stenosis is so rare immediately after operation as to eliminate the necessity of gastro-enterostomy. Gas-

trojejunal ulcer as a possible complication of gastro-enterostomy is also listed as a serious objection.

Those surgeons favoring additional gastro-enterostomy at the time of simple closure claim that simple closure alone does not usually cure the ulcer; that simple closure narrows the lumen and gastro-enterostomy safeguards against subsequent stenosis.

Haberer,[8] in 1919, was apparently the first to attempt to popularize the more radical procedure of partial gastrectomy for acute perforation. This operation, while used extensively in central European clinics, is considered too radical a procedure in this country and in the British Isles. The reason for these divergent views seems to lie in the fact that we are dealing with different types of lesions. While duodenal ulcer in this country is usually single and not associated with gastritis, in central Europe multiple lesions occur in about 30 per cent[9] of the cases and are associated with varying degrees of gastritis, probably necessitating the more radical operation for relief of symptoms.

LOCAL EXCISION WITH PYLOROPLASTY

I fully realize that it is undesirable to attempt to standardize any one operative procedure in dealing with acutely perforated duodenal ulcer. Each case must be considered individually and the operation best suited for that particular case should be employed. I wish, however, to discuss local excision with pyloroplasty in detail, feeling that this procedure has not received its due consideration in the treatment of acute perforation.

It is interesting to note the historic development of pyloroplasty and the place it has taken in gastroduodenal surgery. Heineke,[10] in 1886, was the first to perform a plastic operation on the pylorus for stricture. He divided the constricted pylorus longitudinally and closed the opening transversely. Mikulicz,[11] in 1887, working independently and without the knowledge of Heineke's work, reported the use of the same procedure. The operation has become known as the Heineke - Mikulicz pyloroplasty. Finney,[12] in 1902, reported a new pyloroplasty consisting essentially in lateral anastomosis of the pyloric end of the stomach and the first portion of the duodenum. Horsley,[13] in 1919, reported another type of pyloroplasty, a modification of the Heineke-Mikulicz procedure, in which the incision on the gastric side of the pylorus is twice as long as that on the duodenal side, excising the ulcer and closing transversely. This is termed a physiologic pyloroplasty. The C. H. Mayo[14] pyloroplasty is a modification of the Heineke-Mikulicz technic and may be considered as standing midway between this and the Finney pyloroplasty. The incision assumes a horseshoe shape, making a broad flap in the pyloric angle from which an ulcer, when present, may be excised. This closure is transverse as in the Heineke-Mikulicz operation.

Judd,[15] in 1927, reported a new type of excision with pyloroplasty in which a rectangular segment, including the cap of the duodenum, the ulcer and the anterior two-thirds of the pyloric sphincter is excised, closing the defect transversely. This operation not only removes the ulcer, but eliminates any possibility of pyloric spasm. The physiological reactions of the stomach and duodenum are changed, causing a definite lowering of gastric acidity. This procedure is especially recommended in duodenal ulcer in the young and in high strung individuals with high acids, who would be more liable to develop gastrojejunal ulcer following gastro-enterostomy. The symptomatic relief following this operation for non-perforated duodenal ulcer is commensu-

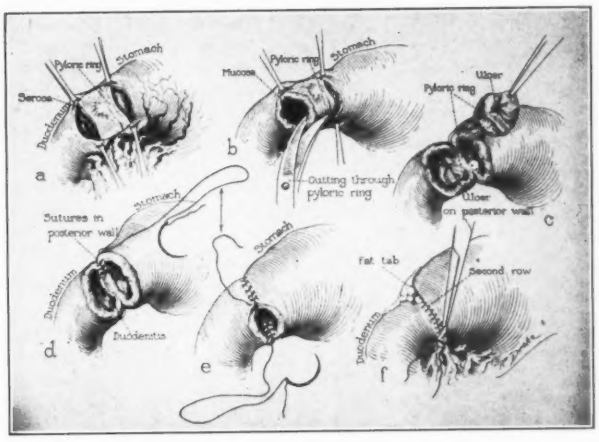

Fig. 1

Drawing illustrating Judd excision with gastroduodenostomy for duodenal ulcer. This operation has been applied to acutely perforated ulcer in the series of cases reported in this paper. (Drawing from *Surgery, Gynecology and Obstetrics*, reproduced through courtesy of Dr. E. S. Judd.)

rate with that of gastro-enterostomy and the mortality rate is less than 1 per cent. Satisfactory symptomatic relief is obtained in 85 to 90 per cent of the cases. Excision with pyloroplasty is especially indicated in duodenal ulcer with hemorrhage, where the ulcer can be removed, or if on the posterior wall can be cauterized or excised. It is contraindicated in the presence of pyloric stenosis and in those cases of duodenal ulcer in which the duodenum is fixed and is not easily accessible for local excision.

When one chooses the operative procedure to be used in acute perforation, the late as well as the immediate results should be considered. The common belief that in those cases surviving simple closure the perforated ulcer heals and permanent relief of symptoms results, seems unwarranted. Gilmour and Saint[16] followed a series of sixty-four cases treated by simple closure and found that 36.4 per cent required a second operation (gastro-enterostomy), only 38 per cent of the patients were entirely free of symptoms. Blackford and Baker[3] reported a follow-up of 253 cases reported by eight surgeons in which 68 per cent were relieved of symptoms, 32 per cent continued to have symptoms, and 20 per cent required a secondary operation. Pool and Dineen[17] report 67 per cent relief of symptoms in 31 cases followed, 7, or 23 per cent, requiring a second operation. Gibson[18] reported that 7 of 28 cases of acute perforation returned for a secondary operation. Hinton[4] reviewed 215 cases of duodenal ulcer under treatment at Bellevue Hospital in 1920 and found that 37 had had operations for previous perforations. Söderlund[19] estimates that only 50 per cent of patients with simple closures are permanently relieved of symptoms.

Therefore, if excision with pyloroplasty can be performed in the presence of acute perforation, with a mortality rate commensurate with that following simple closure, then it is logical to consider it the operation of choice. True shock is not a prominent symptom in acute perforation. It is usually noticed later in the course of this condition and signifies peritonitis rather than perforation. If the general condition of the patient is satisfactory and if the operation is done reasonably early, preferably within the first eight hours, the risk following excision with pyloroplasty should be no greater than with simple closure. It requires only a few minutes longer to do the former operation. It has the additional advantage of removing the friable, inflammatory and ulcerative tissue surrounding the perforation so that closure can be made with healthy tissues. The majority of duodenal ulcers occur within two-thirds of an inch of the pylorus, making excision with pyloroplasty applicable in most cases of acute perforation. The pyloric ring is made actually larger than before operation, thus avoiding the possibility of future obstruction. One would expect practically the same excellent late results following excision with pyloroplasty in acute perforation as obtains in the non-perforated ulcer.

While the treatment of acutely perforated duodenal ulcer by excision with pyloroplasty has not been carried out in a large enough series of cases to draw definite conclusions, the mortality rate in those cases reported is quite favorable. Dowden[20] is credited with being the first surgeon to employ this operation for acute perforation in 1909. He claimed the double advantage of removing the ulcer and widening the lumen. Moynihan[21] reported 22 cases treated in this manner with 4.5 per cent mortality. Bager,[22] of Stockholm, performed this operation in 78 cases with a mortality of 11.5 per cent, losing none of 45 cases operated upon within six hours after perforation. Butler and Carlson,[23] in 1927, reported 10 cases treated by the Horsley and Mayo pyloroplasty with two deaths, one dying of sickle cell anemia and the other of bronchopneumonia. Hinton,[24] in 1928, reported 12 cases treated by the Horsley pyloroplasty with one death from pneumonia. A follow-up showed that several of the cases had mild gastric symptoms, but the x-ray examination was negative for ulcer. One case required a secondary gastro-enterostomy. Grimault,[25] in 1930, reported 10 cases treated by excision with pyloroplasty with no deaths and complete relief of symptoms in each case. Rhodes and Collins,[26] in 1933, reported 33 cases treated by excision with pyloroplasty, but did not give the mortality rate or the late results. They recommended this operation in the early cases. Shawan,[27] in 1933, reported 8 cases, four treated by the Horsley and 4 by the Judd pyloroplasty with no deaths.

The majority of acutely perforated duodenal ulcers are not associated with organic stenosis of the pylorus. The type of ulcer which causes organic pyloric stenosis from scarring and resultant contracture seems to offer assurance against perforation. Brenner[28] was unable to detect organic stenosis in 27 cases of acutely perforated duodenal ulcer studied. It is characteristic of a perforated duodenal ulcer to appear as a round single slightly indurated ulcer 1 to

1.5 cm. in diameter. The edema and inflammatory reaction about the ulcer may be misleading, giving the picture of a true organic stenosis. Therefore, the perforated ulcer lends itself well to excision with pyloroplasty.

I wish to report a series of 14* cases of acutely perforated duodenal ulcer treated by the Judd[15] type of excision with pyloroplasty or partial gastroduodenostomy as termed by Judd (see chart). Eleven cases in this series were admitted to the Section of Surgery, Division A, of the Hillman Hospital, of which Dr. J. M. Mason is Surgeon-in-Chief. Of this series one died, a mortality of 7 per cent. The fatal case was operated upon early and death was attributed to a postoperative psychosis precipitated apparently by withdrawal of alcohol, the patient having been accustomed to drinking large quantities of alcohol regularly. He became maniacal on the third postoperative day and in getting out of bed caused a separation of the wound. In spite of this the abdominal picture was satisfactory. There was no vomiting or abdominal distention at any time. The temperature rose to 107° on the seventh day and remained at that level until death occurred on the ninth postoperative day. The convalescence was unusually smooth and complications were absent in the remaining cases. The majority of the patients left the hospital at the end of the third week.

All of the cases have been followed over a period of three years or less. Eleven have remained well. Two developed recurrent ulcer symptoms. One of these required a secondary operation (gastro-enterostomy) two years after operation for recurrence of a duodenal ulcer which was of the subacute perforating type. Recovery was uneventful following the second operation. It must be remembered that the class of patients represented in this series are from the lower stratum of society. They are less likely to have proper dietary and medical supervision.

The technic employed in this series was essentially that described by Judd for non-perforated duodenal ulcer. The abdomen was opened through a high right rectus incision. The free peritoneal fluid and gastroduodenal secretions were aspirated and the abdominal cavity packed off from the ulcer. A tension suture is placed at the upper and lower borders of the pyloric ring to serve as retractors and as land marks for the closure. A rectangular segment is then outlined with the scalpel to include the cap of the duodenum, the ulcer and the anterior half of the pyloric muscle (Judd removes the anterior two-thirds of the pyloric muscle). This segment is excised and bleeding is controlled with Allis forceps. The normal continuity of the gastro-intestinal tract is reestablished by transverse closure. Number 0 chromic catgut suture on an intestinal needle is used, beginning at each angle and meeting in the middle anteriorly. This suture includes all layers of the stomach and duodenum. A second row brings serosa to serosa. Tags of omentum are brought to each angle and tied. A third row of interrupted linen sutures may or may not be used. In none of the cases was there any true stenosis of the pylorus found at operation. In every case the stomach and duodenum could be brought together without

ACUTE PERFORATED DUODENAL ULCER TREATED BY EXCISION WITH PYLOROPLASTY

Surgeon	No. Cases	No. Deaths	Mortality Per Cent
Butler and Carlson 1927	10	2	20
Moynihan 1928	22	1	4.5
Hinton 1928	12	1	8.3
Bager 1929	78	9	11.5
Grimault 1930	10	0	0
Showan 1933	8	0	0
Donald 1935	14	1	7
Total	154	14	9

ACUTE PERFORATED DUODENAL ULCER TREATED BY JUDD TYPE OF EXCISION WITH PYLOROPLASTY

Number	Age	Hours Elapsing	Immediate Results	Late Results
1	45	3	Recovery	Relief of symptoms
2	48	3	Recovery	Relief of symptoms
3	55	3	Recovery	Relief of symptoms
4	45	5	Recovery	Relief of symptoms
5	29	7	Recovery	Relief of symptoms
6	37	8	Recovery	Relief of symptoms
7	33	11	Recovery	Relief of symptoms
8	34	4	Recovery	Relief of symptoms
9	53	13	Recovery	Relief of symptoms
10	27	24	Recovery	Relief of symptoms
11	27	28*	Recovery	Relief of symptoms
12	27	4	Recovery	Recurrent ulcer symptoms
13	29	3	Recovery	Recurrent ulcer symptoms Necessitating gastro-enterostomy
14	33	3	Died	Developed postoperative alcoholic psychosis
Total 14			1 death	Mortality 7 per cent Good results 80 per cent

*Appendectomy performed also.

*I wish to thank Dr. H. Ralph Smith and Dr. J. P. Collier for giving me the privilege of reporting two of the above cases, operated upon by them. The same type of operation was employed.

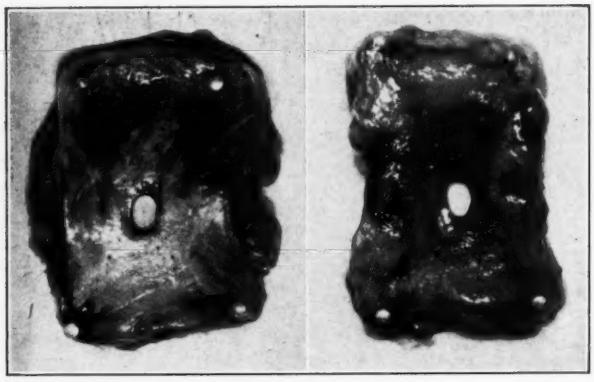

Fig. 2

Actual size photograph showing rectangular segment, including cap of duodenum, perforated ulcer and anterior half of pyloric muscle (anterior and posterior view).

tension. While drainage was used in the majority of cases reported above, this practice has been abandoned in the early cases, being used in only the late cases.

COMMENT

Excision with pyloroplasty is applicable to the majority of acutely perforated duodenal ulcers for the following reasons: most duodenal ulcers occur within the first 1.5 cm. of the duodenum. The severity of the symptoms as a rule places the patient in the hands of the surgeon in sufficient time for this procedure to be carried out. Anyone familiar with gastro-intestinal surgery can perform the operation without incurring additional risk. The mortality rate of the reported cases is favorable and it is quite possible that, by removing the friable, ulcerated tissue composing the ulcer and suturing healthy stomach to healthy duodenum, the chance for leakage is lessened, thus making for lessened mortality. It is logical to assume that the ultimate results will be superior to those following simple closure.

This procedure eliminates the necessity of a gastro-enterostomy with its attending objections. It is contraindicated in those cases associated with true pyloric stenosis, in those in which the duodenum is fixed and not freely accessible for local operation and in late cases of acute perforation. In the presence of these findings simple closure alone or with gastro-enterostomy, as indicated, should be employed.

It should be mentioned that one perforation does not insure against future perforations. Henry[29] reports a case in which five perforations occurred in four years. Ehrlich[30] reported another with three perforations in five years. Therefore, regardless of what procedure is used in the treatment of this condition, these patients should be treated medically for an indefinite length of time to obtain freedom from symptoms following operation, to diminish the chances of a recurrence of ulcer and the possibility of subsequent perforation. It is also important that all foci of infection be removed.

CONCLUSIONS

The mortality rate following operation for acutely perforated duodenal ulcer remains a challenge to the surgeon. Notwithstanding the fact that acutely perforated duodenal ulcer is a serious complication, it seems reasonable to assume that the present mortality rate can be reduced. More attention should be directed to the prevention of perforation. Standardization of the surgical treatment of this condition is undesirable. The operation best suited for the individual case should be the one employed. Excision with pyloroplasty has not received its due consideration in the treatment of acutely perforated duodenal ulcer. It is believed this is the operation of choice in a large percentage of cases. It is contraindicated in late cases of perforation, in the presence of organic pyloric stenosis, and in those cases in which the duodenum is not readily accessible for local excision and pyloroplasty.

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DISCUSSION (*Abstract*)

Dr. Fred W. Bailey, St. Louis, Mo.—While there are many angles of interest in any discussion of peptic ulcer, it appears to me that the essayist's object is to assist in determining the most promising method of conducting the emergency care of a perforated duodenal ulcer. There is no argument about the increasing danger of hour by hour delay following the explosion. The object of any thoughtful surgeon so confronted is four-fold: (1) To be reasonably sure that a perforation has occurred and of its origin; (2) to be definitely sure that the perforation is not localized and safely walled off; (3) to refrain from any plan for surgical treatment until exposure and until the pathologic condition is carefully noted; (4) to utilize the surgical maneuver which best suits the individual case.

Granted a non-localized duodenal perforation, after control of shock, seldom severe, and the necessary preoperative preparation, and with due consideration of the age of the perforation, it is my custom first to locate the leak, aspirate all dependent areas including the pelvis and to send a specimen to the laboratory for a virulence test. After careful walling off, aspiration will prevent further contamination. If the perforation is eight to twelve hours old, simple closure with omental reinforcement is done and a right flank drain inserted. Obstruction is never complete and fluid diet will be tolerated until secondary relief of pyloric stasis is safe. If the perforation is less than six hours and of negative virulence, after careful aspiration, I do not hesitate to adopt the surgical procedure which appears best to fit the case; for example, simple closure in the pin point non-indurated type without obstruction; posterior gastro-enterostomy in the fixed edematous obstructed pylorus; or pyloroplasty, preferably the Judd type which removes the ulcer and eliminates pyloric spasm and when applicable, insures a smoother convalescence and more permanent recovery than do either pyloric resection or gastro-enterostomy. Early cases seldom require drainage. Always drain if in doubt.

In determining the degree of emergency which exists, it is wiser first to evaluate the physical status and resistance of the patient, and the virulence of the contamination, and secondly, the age in hours of the perforation. Radical surgery in the seriously handicapped often exacts a heavy toll from both patient and physician. Standardization of any operative procedure or pre-incision plans are usually a vicious influence. In conclusion I must affirm my belief in the soundness of simple closure in the majority of cases. In early favorable cases, removal of the diseased area with pyloroplasty is desirable. Simple closure is advised in posterior gastro-enterostomy when pyloric obstruction is present and the age of the perforation minimizes the danger of spreading peritonitis. All cases over six to eight hours old (depending on the type of perforation, volume of fluid exodus and virulence of the infective agent) should be treated as a surgical emergency by simple effective closure without further constriction of the pylorus. A plastic excision and transverse suture are to be used in selected cases. The essayist has presented his actual experimental results. His suggestions and precautions are most commendable, and deserve thoughtful consideration and trial.

Dr. Donald (closing).—First, I should like to correct the impression of one of the discussants that the mortality rate in my series of cases was one per cent. There was one death in fourteen cases making a mortality of seven per cent. I should like to emphasize two points, that excision with pyloroplasty is not a difficult procedure and in my experience it is technically less difficult in the presence of acute perforation than in the non-perforated ulcer. I think the reason for this is that there is very little cicatrix about the ulcer and the duodenum is usually not fixed by adhesions as is the case in the chronic non-perforated ulcer. I should also like to reemphasize the point of the proper selection of cases. Each case must be considered individually and the best operation necessary for that particular case should be the one to employ. I believe that excision with pyloroplasty is preferable to simple closure in a large percentage of cases and that it should be used more often than is being done at the present time.

THE OPEN TREATMENT OF PERITONITIS SECONDARY TO APPENDICITIS*

By H. A. GAMBLE, M.D., F.A.C.S.
Greenville, Mississippi

Vital statistics show that the death rate from appendicitis per 100,000 of population has been steadily rising in this country and Canada. Two interpretations can be placed upon these statistics: the first is that there is an increased incidence of the disease; the second that the death rate itself is increasing.

It is generally conceded that the death rate from appendicitis in its early and uncomplicated stages is practically negligible. In the series of 2,265 cases upon which this review is based there were 1,122 cases of acute and subacute and 666 cases of chronic appendicitis in which there was only one death. In any effort to arrive at definite data as to the actual mortality rate this group should be excluded.

The problem is in that class of cases in which the infection has spread beyond the confines of the appendix, resulting in local, general or spreading peritonitis, or localized abscess formation. A review of current literature reveals that in all parts of the country general peritonitis due to appendicitis carries a mortality rate of from 25 to 30 per cent. Haggard says 24.7 per cent. Boland[2] in an analysis of the results of all the hospitals in Atlanta found that while the average mortality rate for the disease as a whole was 2.30 to 7 per cent, general diffuse peritonitis carried a 33 per cent mortality rate. Keyes,[7] in an exceptionally painstaking analysis of the cause of death from appendicitis in the St. Louis Children's Hospital and the Barnes Hospital, states that the death rate from general peritonitis was 28 per cent.

In an endeavor to combat the high mortality incident to peritonitis the pendulum of treatment has swung backward thirty years.

LeGrand Guerry probably has recorded one of the most enviable records, representing a practice of practically a life time in which the cases of well developed peritonitis have been treated according to the Ochsner method of treatment with a deferred operative death rate in this type of case of 1.5 per cent. Grady Hospital, of Atlanta, claims to have reduced the death rate to 16 per cent. Coller and Potter,[3] of the Department of Surgery, University of Michigan Medical School, report a mortality rate of 9.3 per cent in cases treated by the Ochsner, or deferred plan of treatment. We heard Dr. Ochsner present his original paper and soon had an opportunity to apply its principles in practice with unfavorable results in the earliest cases.

Peritonitis secondary to appendicitis, like any other complication resulting from the spread of the infection beyond the walls of the appendix, is a surgical problem. If consideration is given to the nature of the infection and logical measures are employed to prevent its spread, with due attention to the maintenance of the water level of the blood, and the prevention of toxemia from intestinal paresis, the mortality rate can be lowered to such an extent as to compare favorably with the present death rate of uncomplicated cases.

Since 1924, we have practiced a definite plan of operative procedure based upon sound surgical principles which has apparently solved this problem. This plan is founded upon the assumption primarily that in 98 per cent of the cases of peritonitis, anaerobic organisms are present; that with the removal of the appendix the peritoneum is able to overcome the infection; that infection of the abdominal wall plays a more important role in the causation of fatal sequelae than any other factor; that the closure layer by layer of the abdominal wall provides both the culture media and an excellent incubator for the growth of anaerobic organisms; that air is a specific for this type of infection; and lastly, that it is contrary to all surgical principles to close a fresh wound which has just been freely bathed in pus.

Heyd,[5] in 1911, from Friederich's Clinic, reported finding anaerobic organisms in 100 out of 102 cases studied. He isolated seventeen varieties and conceded that they were present in greater profusion than aerobes in all stages of appendicitis and peritonitis and attributed to them the entire causation of gangrene and toxemia. Jennings,[6] in 1931, said that he had been able to isolate anaerobic bacteria in 98 per cent of cases of acute appenditicis. We have found anaerobic growths present in over 75 per cent of our cases, and I am confident that the percentage would be even higher except for some technical error.

We do not feel that the surgical world has given certain facts the important consideration that they deserve. They are definite and spe-

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cific and in them is held the key to the successful treatment of peritonitis secondary to appendicitis. These facts, as stated above, are the foundation upon which the open treatment of peritonitis is based and will bear repetition: (1) anaerobic organisms, particularly Welch's bacillus, are always present in cases of peritonitis; (2) their growth and the elaboration of their toxins is dependent upon the presence of dead or dying tissue; (3) with the removal of the offending focus the natural resistance of the peritoneum is able to cope with the infection; (4) in the closure of the abdominal wound layer by layer one is preparing a medium of traumatized tissue under conditions of heat, moisture and the exclusion of air, most favorably suited to the growth of anaerobic germs; (5) air is a specific against this type of infection; (6) all abdominal wounds potentially infected by this type of organism should be left open.

During the years 1920 to 1925 we noticed an increase in the number of serious wound infections with two cases of spreading gangrene of the abdominal wall in cases operated upon for complicated appendicitis. In order to combat this we began the practice of removal of the appendix, draining the peritoneal cavity, suturing the peritoneum down to the drain, and packing the abdominal wound, the pack being removed after 24 hours, and the wound left open without dressings under a tent with a 40 candle power electric light attached under the roof of the tent.

It was hard to break away from precedent and early teaching, so that in the period from 1925 to 1931 we had two series of cases almost equal in number which afforded an excellent comparison of the relative merits of the open and closed methods of treatment. The first series consisted of 152 cases of a milder character in which it was deemed advisable to institute drainage. The abdominal wall was closed in layers down to the drain. There were three deaths. In the second group, consisting of 59 cases of a really more serious character than the above, and 82 cases of general or spreading peritonitis (141 cases in all) there was one death, this occurring among the cases of general peritonitis.

From November 1, 1931, to November 1, 1935, there have been treated 14 patients suffering from either local abscess, local peritonitis or gangrene, with drainage and closure of the abdominal wound in layers to the drain, with 1 death. In a group of similar cases with closure of the peritoneum down to the drain, leaving the abdominal wound open, 60 in number, there was one death; in a third group of 47 cases of general peritonitis there was 1 death. Personally I have not closed the abdominal wall in any case in which drainage was considered necessary since 1931.

A wound contaminated from a ruptured or abscessed appendix is just as indubitably infected and can result in just as serious a type of inflammation as would a similar wound bathed in fluid from a general peritonitis, and it is just as essential that the one be treated openly as the other. Fresh air is a positive specific for such infections. The surface of the wounds may take on a dirty, gray, green, or black appearance, but this is superficial in character and does not spread as it would in a closed wound, resulting in a formidable infection, spreading gangrene, or sloughing wall with fever and toxemia.

Coincidentally we have had a marked diminution of pulmonary complications in wounds so treated. This may be due partly to the routine postoperative employment of carbon dioxide and oxygen, but we are of the opinion that the open wound is a powerful factor in the prevention of metastatic infections involving the lungs.

The work upon which this review is based has extended from January 1, 1920, to November 1, 1935, and has been arranged chronologically into three periods representing the development of this plan of treatment as follows:

	No. Cases	Deaths	Per Cent
Oct. 1, 1920-Jan. 1, 1925			
Cases of abscess, gangrene or local peritonitis with wound closed in layers to drain	99	1	1+
Cases of general or diffuse peritonitis with wound closed in layers to drain	33	3	9+
Jan. 1, 1925-Nov. 1, 1931			
Cases with abscess, local peritonitis and gangrene, drained and abdominal wound closed to drain	151	3	2
Cases with abscess, local peritonitis or gangrene with peritoneum closed to drain and abdominal wall left open	59	1	1.75
Cases with general peritonitis, drained, peritoneum closed to drain and abdominal wall left open	82	1	1.2
Nov. 1, 1931-Nov. 1, 1935			
Acute suppurative, abscess, local peritonitis or gangrenous, drained and abdominal wound closed down to drain	14	1	7
Acute suppurative, abscess, or local peritonitis or gangrenous appendices, drained and peritoneum closed down to drain and abdominal wall left open	60	1	1.4
Acute general, spreading or diffuse peritonitis drained, with peritoneum closed down to drain and abdominal wall left open	47	1	2.1

To leave the wound open for drainage has long been recognized as good surgical practice, but the fact has never been stressed as it should be nor has it been realized that in this procedure one is inhibiting and controlling the specific causative organism. Pool says that he leaves the wound open in badly infected cases, putting only a few sutures in the peritoneum. Garlock,[4] in reporting a series extending from 1928 to 1932, italicizes that in drainage cases no sutures were placed except a few in the peritoneum.

The operative technic employed is to use preferably a McBurney incision, to protect the abdominal wound with gauze, aspirate any free fluid, deliver and remove the appendix, simply ligating it, cauterizing the stump, but not inverting it. Should the ileum be inflamed, thickened or adherent so as to interfere with peristalsis, an enterostomy is done, using a mushroom catheter. Penrose drains are then introduced into the pelvis and to Morrison's pouch, being brought out at the lower angle of the wound. In those cases with much fluid on the left side of the abdomen, a third drain is placed beneath the spleen through a stab wound. The peritoneum is then closed down to the drain. Sufficient mattress sutures of silver wire are introduced through the abdominal wall down to the peritoneum and attached to buttons on the surface, which prevents disruption. Silkworm-gut sutures are introduced to the peritoneum, the wound is washed with ether, and all open spaces are packed with gauze saturated with an antiseptic solution (1-1000 merthiolate solution) the pack being held in place with silkworm-gut sutures tied in bow knots. Upon the return of the patient to his room he is placed upon his abdomen, which position is maintained for 24 hours. At the end of the first 24 hours the wound is dressed, the pack removed and the wound left open without dressings under a tent with a 40 candle power electric light. The pack is placed in the wound for the first 24 hours for four reasons: (1) to maintain stability of the abdominal wall and lessen the danger of disruption; (2) for the bactericidal effect of the drug; (3) to promote the reversal of the flow of lymph; and (4) to stimulate the formation of an inflammatory barrier around the wound.

Preoperatively measures are taken to overcome dehydration and toxemia by the administration of 10 per cent glucose solution in normal saline solution, or Ringer's solution, and a blood transfusion is given if necessary. While the patient is on the table 5 per cent glucose in normal saline is given continuously subcutaneously, to compensate for the loss of body fluids and maintain the water level of the blood. In all cases of peritonitis following operation glucose 10 per cent in saline, buffer salts or Ringer's solution is given intravenously at the rate of 150 to 200 c. c. per hour, depending upon the tolerance of the individual, for as many days as may be necessary. Since 1931 we have administered postoperatively a therapeutic dose of antigangrene serum. There is usually a severe reaction. We cannot say whether the serum has been of any benefit or not, because in the six-year period prior to its use there was one death in 82 cases and in the four-year period since its employment there has been one death in 46 cases, therefore we have had no way to reach a definite conclusion.

Also in all cases gastric drainage is maintained with the Levine tube and the negative pressure Wangensteen apparatus. The latter, we feel, has been of invaluable assistance in the maintenance of decompression and the prevention of obstructive symptoms.

This plan of treatment has been criticised from two standpoints: (1) it requires longer hospitalization, and (2) theoretically there is an increased probability of hernia. As regards the first, the criticism is not well founded, for in the same type of case the period of hospitalization is in reality shorter for the open treated wound. Again, if the choice is left to the patient and he is told that by one method of treatment there are 1.5 chances in 100 of dying and by the other the chances are 30 in 100 of dying, he quickly decides the issue. Hernias have been noticeable by the infrequency of their occurrence. Up to the present time we have been able to find only four patients in whom hernia has developed. The reason for this is twofold: (1) the McBurney incision is usually favored, and (2) there is no sloughing of tissue. The hernias which we have had to repair were with one exception following a right rectus incision.

The employment of measures to maintain nutrition and promote elimination are all valuable adjuncts. However, the marked lowering of the death rate from peritonitis due to appendicitis over a period of eleven years to 1.5+ per cent (129 cases with 2 deaths) as compared to a general death rate of from 25 to 30 per cent can be attributed to recognition of the type and the cultural characteristics of the organisms always found associated with the disease, and to the fact that the high death rate from peritonitis is due primarily to infection of the abdominal wall

by anaerobic organisms, and furthermore to the adoption of an open method of treatment which inhibits or prevents the growth of anaerobes in the wound.

Removal of the offending organ, drainage of the peritoneal cavity, and leaving the abdominal wound open to the air is a sane operative procedure based upon sound surgical principles which has placed surgical interference upon such a safe foundation and so lowered the death rate as to render this method, for us, the one of choice in treating this type of peritonitis.

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DISCUSSION (*Abstract*)

Dr. Thomas G. Orr, Kansas City, Kan.—Since the publication of Williams in 1926 in which he suggested that the toxin of *Bacillus welchii* is the injurious agent in acute intestinal obstruction and peritonitis much interest has been manifested in anaerobic organisms as the lethal factor in these two conditions. Williams reported lowering of the death rate in intestinal obstruction and peritonitis by administering *Bacillus welchii* antitoxin.

The essayist states that the plan of his treatment is founded upon five assumptions. The first assumption that in 98 per cent of the cases of peritonitis anaerobic organisms are present may be true but there has been no proof that in all cases such organisms are virulent. The second assumption that after removal of the appendix the peritoneum is able to overcome any infection seems to me a very doubtful assumption. In my own experience I am certain that patients have died of peritonitis due to direct infection of the peritoneum after the appendix had been removed. The third assumption that infection of the abdominal wall plays a more important role in the fatal sequelae than any other factor is also open to some doubt. It is perfectly true that serious gas bacillus infections do occur in the abdominal wall after drainage of abdominal infections but it hardly seems justifiable to exclude the direct toxic effect of peritoneal infection on the body, or to fail to consider the lethal possibilities of paralysis of the bowel with its distention and obstructive symptoms. We must agree with the fourth assumption that closure of the abdominal wall layer by layer provides good culture media and an excellent incubator for the growth of anaerobic organisms. It is equally true that one rarely finds a surgeon who completely closes such a wound without some drainage when there exists a suppurative infection as the result of appendicitis. The fifth and last assumption that it is contrary to all surgical principles to close a fresh wound which has just been freely bathed in pus seems to me sound reasoning.

The results of this author are truly remarkable. He may well look with great pride upon his two series of general peritonitis cases, totaling 129, with a combined mortality averaging 1.65 per cent. If other surgeons can accomplish as much by the open treatment, as described, the problem of the treatment of acute diffuse peritonitis is about completely solved.

Dr. E. V. Mastin, St. Louis, Mo.—I wish to congratulate Dr. Gamble upon having arrived at a method of treatment for general peritonitis complicating appendicitis, which has reduced the mortality of this serious disease to the remarkably low percentage of 1.5. Very little can be said other than praise.

I was very much interested in what Dr. Gamble had to say about leaving the wounds open down to the peritoneum and packing them with gauze. This is a decided advance in treatment. I have been draining these cases through a stab wound as this allows the operative wound a better opportunity for satisfactory healing.

I do not like the typical McBurney incision on account of the lack of exposure, but prefer an oblique incision in the lower right quadrant directly over the appendix, as this affords greater ease in performance of the operation and less soiling of the peritoneal cavity. The incision should be long enough to secure good exposure of the appendical region and to avoid undue handling of the intestines and excessive retraction of the abdominal walls.

As Dr. Gamble has said, in cases where the ileum is very much thickened and inflamed, an enterostomy is certainly a life-saving procedure in many instances. I have used the mushroom catheter, but have discarded it in favor of a smaller catheter inserted after the method of Wetzel, as I had to do a secondary closure of the enterostomy opening in several of the cases in which I had used the mushroom catheter.

A few years ago Dr. Hendon, of Louisville, Kentucky, suggested doing a decompression of the intestines by passing a catheter through the resected lumen of the appendix, close to the base. This can be easily and quickly done, and has definitely decreased the incidence of postoperative ileus and intestinal obstruction, and has definitely lowered the mortality rate.

The thin soft penrose drain is undoubtedly the drain of choice, as they are less prone to cause pressure necrosis and later fecal fistulae.

The preoperative preparation of these patients cannot be emphasized too strongly. As soon as a diagnosis of generalized peritonitis is made the question of the method of treatment must be decided upon. Often surgeons insist upon immediate operation in such cases, regardless of the condition of the patient. This rule will cause only disastrous results. Each case should be studied and treated separately and individually. There are no rules to follow and the experience of the surgeon must dictate the best course to pursue as to the exact time of operation.

A patient presenting marked distention of the abdomen with only slight rigidity of the abdominal muscles, a pulse rate of 110 or over, a low blood pressure, cyanosis, cold extremities, should not have immediate surgical

intervention. It is this symptom-complex that indicates a virulent generalized peritonitis and in which we expect the highest operative mortality. It is much better in these cases to postpone operation until such a time as the patient reacts. Give continuous glucose intravenously, institute gastric drainage with suction, and a blood transfusion if necessary. The exception to this procedure is in the very young and in the very old patients in whom it seems to have little or no effect upon the disease.

Some time ago, I had occasion to review 349 consecutive cases of acute appendicitis, operated upon at St. Luke's Hospital. Two hundred sixty-four were reported as suppurative, 65 as gangrenous, and 17 as acute catarrhal. There were 20 deaths, or a mortality rate of 5.76 per cent.

Again let me congratulate Dr. Gamble on his results.

TOTAL VERSUS SUBTOTAL HYSTERECTOMY*

By FRANK HAGAMAN, M.D.
Jackson, Mississippi

Although opinion varies in regard to the type of hysterectomy to be performed for benign lesions of the uterus, it seems to be well agreed that the greatest benefit that accrues from the performance of the more extensive total hysterectomy is the elimination of the cervix uteri as a possible site for malignant degeneration. Conceding this fact, it would seem that the matter could be disposed of simply by consideration of two factors: first, the incidence of carcinoma in the remaining cervical stump following subtotal hysterectomy; and second, the percentage of increased risks of total over subtotal hysterectomy.

Unfortunately there is no unanimity of opinion in regard to either of these. Statistics on the percentage of malignant degeneration in the remaining cervical stump varies from that of Polak (*Table 1*), who in a collected series found an incidence of 2 per cent, to that of Hochman (Von Graff), who reported 0.27 per cent. Fourteen thousand nine hundred and three supravaginal operations (collected) show an incidence of 0.65 per cent.

As regards the relative safety of the two operations (and here, of course, most accurate figures can be obtained), there is an even wider divergence of opinion (*Table 2*). From the Mayo Clinic 4,963 cases are reported with a mortality differential of only 0.6 per cent between the two operations, whereas Bartlett and Simmons, of Detroit, report 2,942 operations with a mortality 5.3 per cent greater in total hysterectomy. Although Fullerton and Danzis show fewer deaths following the more extensive operation, both conclude that the increased risk of total hysterectomy is not warranted unless the cervix is the site of extensive disease. Lahey of Boston states in a personal communication that he has never been in favor of total hysterectomy,

"since it shortens the vagina, interferes with sex life, adds to the operative risk, and is not justified when these complications are compared with the incidence of carcinoma in the cervical stump."

He further states that if one takes out the cervix because of the danger of malignancy in it, it would be about as logical to remove many other things in which cancer might occur, and if the cervical stump does become malignant, it can be handled quite well with radium.

Siddall and Mack do not agree with the statement that the more experienced operators could obtain as low a mortality rate with total as subtotal hysterectomy, and present the statistics

Table 1

INCIDENCE OF CARCINOMATA IN CERVICAL STUMP

	Number Subtotal Operations	Discovered Malignancies	Percentage
Polak	.....	....	2
Hochman (von Graff)	.....	....	.27
Tarnier, *et al.*	9,308	45	.5
Graves, *et al.*	4,785	44	1.0
Pearse	810	8	1.0
Total	14,903	94	0.65

Table 2

MORTALITY IN TOTAL VERSUS SUBTOTAL HYSTERECTOMIES

	Subtotal Hysterectomy		Total Hysterectomy	
	Number	Mortality Per Cent	Number	Mortality Per Cent
Mayo and Mayo	3,085	1.2	1,588	1.8
Bartlett and Simmons	2,733	1.7	209	7.0
Fullerton and Faulkner	609	4.4	1,078	4.1
Danzis	258	1.1	59	0
Siddall and Mack	1,141	2.6	235	6.4
Burch and Burch	166	4.2	32	3.1
Sellers	179	3.0	84	7.1
Mitchell	195	0	73	6.8
Total	8,366	2.2	3,358	3.3

*Read in Section on Gynecology, Southern Medical Association, Twenty-Ninth Annual Meeting, St. Louis, Missouri, November 19-22, 1935.

of work done by various operators on the staff of the Harper Hospital in support of this view. Masson, of the Mayo Clinic, on the other hand, does a total hysterectomy in the majority of cases, and thinks it advisable in all women close to the menopause age who have had children. He feels that anyone who is doing much pelvic work can do a total operation just as safely as they can a subtotal, and if the operation is done properly there is no tendency toward shortening of the vagina, and no more tendency for a vaginal hernia to develop. Farrar, of New York, states that the incidence of cancer occurring with fibroids is probably about 5 to 8 per cent, and that the total abdominal hysterectomy should be the operation of choice for benign conditions of the uterus necessitating hysterectomy.

In an endeavor to formulate a plan for future observance with regard to hysterectomy, my associate, Dr. H. R. Shands, and I have reviewed our hysterectomies from a standpoint of morbidity as well as mortality (*Table 3*). They

Table 3

SUMMARY OF 212 CONSECUTIVE HYSTERECTOMIES

	Subtotal	Total
Number of operations	129	83
Average number days in hospital	11.6	12.2
Average daily temperature	99.1°	99.2°
Average highest temperature	100.4°	100.5°
Mortality per cent	0	3.6
Total number of operations	212	
Total mortality per cent	1.4	

represent 4 per cent of all surgical operations performed by us during the period of investigation and include every operation for the removal of the uterus occurring in our private practice during that time. The general surgical mortality for that period was 1.7 per cent.

There were 129 subtotal and 83 total operations, making 212 in all with a mortality of 1.4 per cent. A comparison of the hospital morbidity reveals very little difference between the operations, although the average number of days in the hospital, average daily temperature, and average highest temperature are all slightly higher in total hysterectomy. There were three deaths, one as a result of embolism with thrombosis of pulmonary artery, and two from pelvic peritonitis, all occurring following the total operation. It has been our practice in the past to employ vaginal drainage with total hysterectomy, as practiced by Dr. C. H. Mayo, but we now doubt the advisability of this measure. Neither of the patients who died of peritonitis had any acute or chronic infection in the pelvis at the time of operation, and vaginal preparation similar to that advocated by Masson was carried out prior to laparotomy. It is possible that the vaginal drain was responsible for the fatal complications.

In addition, recently I have noted an unhealed area on several occasions in the vault of the vagina six weeks after operation, which might have been caused by the drainage. These areas healed promptly following treatment, but were the source of some discomfort and annoyance to the patients, and detracted somewhat from the success of the operation.

There has been no complaint in regard to shortening of the vagina and interference with sex life, and no vaginal herniae are known to have developed subsequent to either type of operation. All the women who have complained of leukorrheal discharge following supravaginal hysterectomy have been relieved by thorough cauterization of the cervical canal. In one case, prolapse of the cervical stump without cystocele or rectocele, amputation of the remaining cervix was necessary six months after the first operation.

Only one surgical accident occurred in this series. In separating dense adhesions about the uterus, a hole was torn in the rectum. This was sutured immediately, and although the convalescence was stormy, a fecal fistula did not develop and the patient made a complete recovery. There were no known instances of damage to either ureter, and we have discovered no vesicovaginal fistulae. One case of carcinoma of the cervical stump has been seen. The patient came for treatment only after the vaginal vault had become involved, and although extensive radium and x-ray therapy was used, a cure was not obtained.

SUMMARY

Three years ago I believed that total hysterectomy was the method of choice for all cases requiring removal of the uterus whenever the general and local condition of the patient would permit, and a large number of the total hysterectomies have been done since that time. With the more frequent employment of this operation, however, has come a fuller appreciation of its attendant risks, and after careful study of individual and collected statistics, we now feel that the total operation should be used only

when the less extensive operation will not suffice.

So that the field of usefulness of subtotal hysterectomy may be broadened and the development of malignancy in the cervical stump minimized, a definite operative routine has been adopted. Preliminary to laparotomy, a dilatation and diagnostic curettage is performed. If no scrapings suggestive of malignancy are seen, thorough cauterization of the entire cervical canal is done, followed by supravaginal hysterectomy. As soon as the body of the uterus is removed, it is cut open and examined for any malignant change. If any suspicious area is found, the cervix is removed. Otherwise the supravaginal operation is completed.

By the routine use of certain precautionary measures in connection with subtotal hysterectomy, it is believed that the occurrence of malignant degeneration in the remaining stump will not be much greater than occurs in a normal cervix, and the less extensive operation can be safely employed in a much larger percentage of cases. If the cervix is so badly lacerated or diseased that cauterization or conization cannot promise the same immunity to malignant degeneration that exists following vaginal amputation of the cervix, or if the question of co-existing malignancy cannot be satisfactorily eliminated, total hysterectomy should be done.

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DISCUSSION (*Abstract*)

Dr. H. S. Crossen, St. Louis, Mo.—Dr. Hagaman has touched on a very real problem and I agree thoroughly with his conclusion, that the total operation should be used only when there are special conditions warranting the additional risk incurred. In abdomino-pelvic operations the patient's strength is often taxed to the limit by the primary work necessary, and it is a serious matter to prolong the operation for the additional deep work required safely to remove the cervix and repair the resulting deficiency of support.

In some medical articles, this additional work is tossed off as a small detail, quickly executed, presumably in about one minute. But the fallacy of this time-appraisal becomes apparent when you try to do it yourself, or when you watch one of these supposed lightning operators digging in the depth of the pelvis to get the bladder and ureters out of the way for excision of the cervix and repair of the severed supports.

There is a remarkable contrast between the operation on paper and the operation in the pelvis. In removing the cervix, we must work down into the dangerous area of the bladder and ureters. To make clear the liability of injury of these structures, I need only remind you of the many bladder and ureteral injuries resulting from hysterectomy. Most of these injuries occur in removal of the cervix.

The problem of preventing cancer of the cervical stump is a serious one, and it must be faced by every surgeon doing pelvic work. But the adoption of a general rule to employ complete hysterectomy instead of supravaginal hysterectomy, as proposed by some surgeons, does not solve the problem. Such a rule only substitutes one danger for another. It substitutes the danger of death from added operative and postoperative strain for the more remote danger of cancer development in the cervical stump. Instead of substituting one danger for another, we should eliminate both dangers.

In trying to solve this problem in my own work, so as to do what was necessary for the patient with the minimum of danger, immediate and remote, I have for years followed a definite plan of procedure in hysterectomies, as follows:

Before operation, examine and note whether cervix is safe to leave (normal) or should be removed in the operation or should be coned after abdominal closure.

During operation, have someone immediately open the excised uterus and large myomata. If malignancy or a suspicious lesion is found, remove the cervix. If malignancy is excluded, and the cervix is normal, preserve the cervix.

When dealing with cervicitis (malignancy excluded) the treatment depends on the conditions in the case. If local and general conditions are good, remove the cervix for extensive cervicitis, and cone the cervix per vaginam for moderate cervicitis. If local or general conditions are bad, cone the cervix per vaginam—either immediately after abdominal closure or later when the patient is out of danger.

In coning out the area of chronic cervicitis after closing the abdomen, I formerly employed the regular conical excision with knife and extensive suturing. Now, however, I employ the electric cutting wire loop.

This simplifies the work very much. If the cervicitis is small in amount, one rotation of the cutting wire loop eliminates it, and no suturing is needed.

If the cervicitis is extension, additional bites are taken out with the wire loop as required. If this extra excision leaves a wide surface, a Sturmdorf suture is placed front and back, to insure inversion in healing. The marked advantage of the high-frequency wire-loop excision is that it eliminates troublesome bleeding and extensive suturing.

Dr. F. Webb Griffith, Asheville, N. C.—At the Miami meeting of the Southern Surgical Association three years ago I analyzed the result of approximately seven hundred hysterectomies done by me personally. While this is not a large number, the fact that they were all done by one person gives a certain uniformity for comparison.

The mortality was two per cent. The great majority were done by the subtotal method. The mortality was far higher in the subtotal than in the total.

From this statement we might infer that the subtotal was the more dangerous method. Quite the contrary is true, for all of the difficult and poor risk cases were done by the subtotal method, and the total was used in the comparatively easy cases.

Insofar as I know, cancer developed in a remaining stump in only one case. As my practice is from a relatively small territory, had any other cases of cancer developed, the chances are I would have heard of them.

I am firmly convinced that a long series of consecutive unselected cases of total hysterectomy in the hands of the average surgeon, and even in the hands of a gynecologist, would carry a higher mortality by far than the mortality arising from an equal number of subtotal hysterectomies, plus deaths from subsequent cancer of a stump.

In very stout women or in those cases in which marked difficulty is encountered and you would like to remove the cervix, why not do a subtotal hysterectomy, cupping out the cervix, and then, after the abdomen has been closed, quickly amputate or core out the cervix from below.

That will accomplish practically everything that can be accomplished by total hysterectomy, and with definitely less risk.

Dr. E. Lee Dorsett, St. Louis, Mo.—I quite agree with the essayist that the morbidity and mortality of total hysterectomy is much higher than that of subtotal. There is no question that a chronically infected cervix should be removed but not at the risk of health or life of the patient. It is much better judgment in some cases to leave this cervix and treat it by coning or cauterization. I have seen five cases of vaginal hernia in which the vaginal vault protruded from the vagina that followed total hysterectomy for so-called chronic metritis.

While in some cases a total hysterectomy may be easily performed, in other cases great difficulties are encountered and the operation considerably prolonged with resulting shock to the patient.

LOGICAL ECLAMPTIC THERAPY EVOLVED AFTER 19 YEARS' STUDY IN 232 CASES*

By JAMES R. REINBERGER, M.D.
and
PERCY B. RUSSELL, JR., M.D.
Memphis, Tennessee

The history of eclamptic therapy† reveals disagreement from the earliest times to the present day as to whether the patient should be delivered immediately or treated medically. Despite various methods employed for the control of the convulsive state, there still persists a high incidence of deaths, for fully one-third of all maternal deaths result from eclampsia. The etiology is a controversial question and the treatment empirical. As yet no specific cause has been determined, but unquestionably it is a circulating toxin with no predilection for one system, but more often affecting two or more. This uncertainty has likewise caused much time to be expended by various workers with clinical research in an effort to clarify the above problem. Many have attempted to differentiate the toxemias into several clinical entities in the hope of finding a solution. We do not decry this approach, yet the presentation of too many classifications have confused both student and physician. It is felt that the impossibility of actually classifying each case has subordinated the recognition of mild toxemias which develop into more grave ones. It would seem, therefore, that there is a genuine justification for papers which aim at simplifying the accumulated knowledge.

Certain fundamental knowledge is essential for the early diagnosis of the toxemias, and unless text-books revise their chapters relative to the early premonitory physical signs of eclampsia, disabilities and deaths cannot be reduced.

Many years of observation have shown the value of blood pressure recordings, which are probably the most common, constant indication of toxemia. However, it is not appreciated generally that the blood pressure is normally lower during pregnancy. We have observed that the

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*From the Department of Obstetrics, University of Tennessee.

†Reinberger and Schreirer: Jour. Tenn. Med. Assn., **23**:— (July) 1930.

blood pressure in the early trimesters of pregnancy fluctuates between 90/60 and 110/60. Thus a rise in blood pressure to 130/60, which is 40 points above normal, is stressed as a danger signal. Blood pressure above this point to 150/60 is considered potentially eclamptic; and in those above this reading occur the graver toxemias.

Minor disturbances of the nervous system, though hardly mentioned in the literature, have been found to be the second most constant sign of incipient toxemia. Manifestations such as slight nervous irritability, mild and transient headache, occasional dizziness and fleeting specks before the eyes, are often complaints of the patient. Many patients cannot actually describe their ill feeling, but simply say they are "more nervous than usual." The more progressive the toxemia, the more constant and intensified are the nervous symptoms usually called the pre-eclamptic syndrome. The convulsive state is an exaggerated nervous manifestation.

The recording of weight has proven invaluable. A gain of weight of over eight pounds per month, even though not associated with other symptoms, is indicative of impending toxemia. A gain in weight of over twenty-five pounds in the first seven months demands active treatment, for at this period of gestation most toxemias develop. It has been difficult actually to designate the number of pounds to be gained with each month of gestation; but the above guide has served as an index. The gain is most often caused by retention of body fluids.

From its earliest recognition, the presence of albumin in the urine has been accepted as one of the most constant findings. Our experience with the value of this test has relegated its importance much beneath blood pressure, nervous irritability and gain in weight. It is rarely found in incipient toxemias. Its presence is only of diagnostic value. It is usually a sign of the more severe type of toxemia and may be present only shortly before or after a convulsion.

Even though run routinely, blood chemical tests have proven of no value either from a diagnostic or prognostic standpoint. It is hoped that future biochemical blood studies will become more helpful.

Correlation of minor or even major symptoms of the acute toxemic group has been found very advantageous. One symptom may seem almost negligible, but when associated with any second finding, it always indicates seriousness. Thus patients presenting any two of the major symptoms should be kept under almost constant surveillance or, when possible, hospitalized. The value of constant observation cannot be underestimated. Frequency of such observations is in direct ratio to the severity of the toxemia. It is quite common to see an eclamptic patient whose relatives and even physician insist that no premonitory symptoms were present. Detailed questioning usually reveals that only major symptoms had been looked for or that long intervals between observations accounted for the lack of recognition.

The classification of toxemias used in our department for the past five years has simplified their study for our students. It is taught that the various toxemias, with the exception of chronic nephritis, are one and the same, varying only in the extent of the intensification of the symptoms and physical signs. Thus the stressing of the earliest signs and symptoms has not only brought into prominence cases formerly overlooked, but it has also intensified interest in the classifying of all cases. A review of our records prior to the introduction of this simplified grouping indicates that many of the earlier toxemias were overlooked.

The toxemias are divided into five groups:

(1) Incipient toxemia comparable to low kidney reserve.

(2) Moderate toxemia comparable to pre-eclampsia.

(3) Severe toxemia comparable to eclampsia.

(4) Chronic nephritis with pregnancy superimposed comparable to nephritic toxemia.

(5) Benign hypertension comparable to medical benign hypertension.

Group 1.—Incipient toxemias comprise the largest number of cases. The most common finding is a slight elevation of blood pressure whose upper limits have been arbitrarily placed at 130/60. Minor nervous manifestations are usually present. Albumin may be present in the urine, but it is more often absent. The eye-grounds are negative; the blood chemical tests negative. Slight edema may be present; and if so, it is associated with a relative gain in weight.

Group 2.—In moderate toxemias the blood pressure is arbitrarily placed above 130/60. Nervous manifestations are more constant and pronounced. Albumin in the urine is more often present. Renal function tests are normal, but the urinary output is often slightly diminished. Blood chemical tests are negative. The eye-grounds often show spasticity of blood vessels,

but edema is quite the common finding in more advanced cases. Generalized edema with its associated weight gain is noted in the majority of cases.

Group 3.—In grave toxemias the blood pressure is elevated. Its height is not always in ratio to the severity of the toxemia. Blood pressures ranging from 150/80 to 200/100 are encountered, although in some patients it may be comparatively low. The nervous manifestations are exaggerated to the convulsive and comatose state.. Renal function shows a diminished output of the total quantity of urine. Large quantities of albumin are present in the urine, but the quantity is not always necessarily in ratio to the severity of the toxemia. Blood chemical tests reveal nitrogen retention. The eyegrounds reveal spasticity of the retinal vessels and edema. The generalized edema is more marked with an associated gain in weight.

Group 4.—Chronic nephritis with pregnancy superimposed has a different etiological background. This is a distinct clinical entity. In some cases the history is important in revealing a past acute contagious disease, chronic focus of infection, or past cardiorenal disease, but more often the history is essentially negative. The history of other cases indicates that repeated and short spaced pregnancies accounted for the presence of cardiorenal disease. Physical examination reveals the hypertension, impaired renal function with nitrogen retention in the blood. Quite often myocardial involvement is present. The eyegrounds show vascular tortuosity, hemorrhage and degenerative retinitis. In contrast to traditional belief, we have observed that degenerative retinitis is not always of long standing. Following the termination of pregnancy, we have seen vision and eyegrounds improve beyond belief. It is often difficult initially to classify some cases; for quite often it is necessary to follow up and study each case long after the termination of pregnancy. Pregnancy is the best physiological test of renal function, thus more consideration should be given this group. The death rate of such cases in a five-year follow-up was greater than in all other acute toxemias.

Group 5.—In benign hypertension of pregnancy, the patients are usually unaware of impending illness. The only physical finding is hypertension usually above 160. This group is rather questionable as far as permanent classification is concerned. The blood pressure returns to nearly normal in most cases after the termination of pregnancy, while ultimately others have been placed in the chronic nephritic group.

Any paper dealing with the actual treatment of eclampsia is incomplete unless the preventive treatment is included. Incipient toxemias can be relieved by simple elimination, diet and rest. We do not feel that a complicated regime is imperative; but we have found that simple instructions assure more cooperation. Magnesium sulphate is advised to promote elimination. The diet used for a great many years has been the so-called high carbohydrate, low protein, salt-free diet. Patients are instructed to reduce or eliminate such foods as meat, fish, eggs, cheese and salt. We feel that this diet as a preventive measure will probably invite discussion. We are cognizant perhaps that strict adherence to this diet as a preventive measure will probably invite discussion. We are cognizant, perhaps, that strict adherence to this diet may be a factor in the production of the so-called anemias of pregnancy; for routine blood studies have demonstrated that many cases have a red cell count of less than 3,500,000 and hemoglobin of less than 60 per cent. Iron, liver extract and vitamins are prescribed for such patients.

Patients who do not improve by such simple measures are given absolute bed rest. This seems as efficacious as other measures. Diet is greatly reduced and more elimination is promoted. Sedatives are given and calcium and viosterol are added in large quantities to the diet. Cases presenting marked edema with insufficient renal elimination are given glucose and magnesium sulphate solution to promote diuresis.

It must not be forgotten that preventive measures will not control every case which is progressing into eclampsia. This erroneous idea has been widely disseminated. Many cases require the interruption of pregnancy. The method employed at termination is of considerable importance, for often convulsive seizures are precipitated as a result of the method. Medical induction and rupture of membranes have proven satisfactory in a considerable number of cases. Bag induction is used only in multiparae at term with soft and widely dilated cervices. Abdominal cesarean section is being more generally employed in the majority of all cases, because it is the safest and surest method.

The active treatment of eclampsia is outlined more in generalities than in dogmatic routine. The care of eclamptic patients embodies principles different from those used for other acutely ill patients.

The body is kept warm in order to avoid marked changes in temperature which augment the irritability of the nervous system. Restraints have been abandoned, for restraint unquestionably initiates revolt and hyper-excitability with muscular activity, even though the patient is unconscious. Persistent vomiting is relieved by gastric lavage. The elevation of the foot of the bed promotes drainage and prevents aspiration of secretions. Our recent studies of alkalosis and acidosis indicate that the administration of sodium bicarbonate will neutralize the ever-present acidosis of eclampsia. It can be given either orally or intravenously. The dosage should be in ratio to the lowering of the blood carbon dioxide combining power. Intranasal oxygen is given for the relief of cyanosis and cardiac embarrassment.

The control of the convulsions is begun prior to general therapy. The physician using the drug and acquainted with its potentialities is as important as the drug itself. Morphine sulphate has served well upon many occasions. Magnesium sulphate either intravenously or intramuscularly has been used with astonishing results and with no ill effects. Recently several of the barbiturates have been employed successfully to control the convulsions. It has been impossible for us to establish the one and only sedative to be used routinely. We have seen morphine, magnesium sulphate and even the barbiturates fail singularly and constantly. On the contrary, we have seen patients fail to respond to morphine, yet yield to magnesium sulphate; and, patients failing to yield to magnesium sulphate, may react favorably to sodium iso-amylethyl barbiturate and phenobarbital. Any of the above mentioned sedatives, if given properly, will control convulsions in most cases.

The importance of elimination cannot be underestimated. If simple elimination plays a large part in the prevention of the disease, it plays a tremendous part in recovery. All measures have been used and all are probably of value. Magnesium sulphate is given by mouth to the majority of patients. There was a time when, because of fallacious reasoning, every patient received a colonic irrigation. It was originally assumed that this procedure derived most of its benefit from indirect stimulation of the renal system. Phlebotomy is occasionally employed. It is used only in those patients having extremely high blood pressure or in almost continuous convulsive seizure. We feel that it plays no part in the actual cure of the disease itself, but only relieves the hypertensive crisis, namely, cerebral hemorrhage or acute cardiac dilatation.

Elimination is further enhanced by the administration of 2,000 to 3,000 c. c. of fluids per day. Fluids are forced orally, if the patient is conscious. It is given intravenously and subcutaneously if the patient is in coma. We have discontinued the administration of large quantities of fluids by the intravenous method; for many of these patients have a myocarditis and some have died as a result of this procedure. We administer only 500 c. c. of glucose or any solution intravenously and make up the remaining portion of the required daily need by subcutaneous injection. Rectal installation has been discontinued because of the uncertainty of absorption. Lack of knowledge of the urinary output greatly hampers prognostic acumen. A retention catheter introduced during the preparation of the patient and left *in situ* has overcome this obstacle. Prior to the adoption of the procedure it was impossible to estimate the total output because of incontinence and forced catharsis.

Pulmonary edema is one of the most common complications of eclampsia. Its true cause is an undecided question. Many feel that it results from cardiac imbalance, myocarditis or the retention of body fluids. Digitalis seems to have relieved some of these cases. However, we have found atropine sulphate to be the most efficacious drug. The dosage must be massive and repeated as the occasion demands.

Experience has demonstrated that most patients will respond to the above therapy, but that rigid adherence to it must be supplanted by surgical intervention when failure is apparent. The response must be rapid to be effective, for a previous study in cases treated solely medically demonstrated that 66 per cent of all deaths occurred within twenty-four hours after admission and 33 per cent within six hours. There is a true endpoint syndrome denoting the failure of medical therapy. Experienced and constant observation are necessary for its recognition. This period of warning has been designated as "the break." The syndrome consists of definite changes in symptoms and physical signs as follows: (1) increase in the temperature, pulse and respiration; (2) evidence of pulmonary edema; (3) increased cyanosis; (4) marked oliguria or anuria; and (5) increase in blood pressure with the diastolic ratio disturbed.

The urgent necessity for the recognition of these findings demands that the pulse and re-

spiratory rate be noted every fifteen to thirty minutes and the rectal temperature every hour. Every hour of delay in recognition lessens the patient's chances of recovery. The first evidence of "the break" is manifested by a sustained, increased pulse and respiratory rate. This must not be confused with the transitory changes often observed in patients who react favorably. The elevation of the respiratory rate is nearly always associated with moist rales in the chest. This intimates an impending pulmonary edema. Cyanosis nearly always occurs coincidentally with the increased respiratory rate. It is evidenced first in the nails and later becomes more generalized. A rise in temperature often occurs, but is not in ratio to the other findings; for many severe cases exhibit only a slight increase, while milder ones are more decided. The elevation of blood pressure is not always constant; but any change in the diastolic reading is suggestive. There is marked oliguria and anuria.

The appearance of several of these symptoms intensifies the gravity of the changed condition, and the delivery of the patient becomes imperative. Unfortunately, in many cases "the break" has occurred before admission to the hospital. In other patients, it is masked. Often this uncertainty has delayed the decision for operative interference which might have resulted in recovery of the patient. We have found that the duration of the disease prior to admission likewise lessens the patient's chance to respond. This knowledge sways any indecision. We believe that the correlation of the history and findings followed by immediate surgical intervention, when indicated, will prevent many deaths.

The type of surgical management depends mostly upon the condition of the lower uterine segment. Experience has demonstrated that any forcible procedure employed to remove this barrier results in trauma and shock. We feel that cesarean section eliminates these dangers. Vaginal delivery is always indicated when the cervix is completely dilated.

The type of anesthesia is of utmost importance in the surgical management of eclampsia. Years ago Stander said: "The good results from the medical treatment and the bad results from the surgical treatment may hinge on the question of anesthesia." Observations have shown that acidosis is a common finding in the eclamptic patient and inhalation anesthesia intensifies this complication. Thus the employment of inhalation anesthesia subjects the patient to an undue hazard. We have long employed local anesthesia for all cesarean sections, and have attempted to substitute local perineal infiltration and nerve block for vaginal deliveries. As experience is gained in its use, spinal anesthesia probably will prove superior for both types of delivery.

THE END RESULTS WITH ECLAMPTIC THERAPY IN THE MEMPHIS GENERAL HOSPITAL

The total number of cases treated in this service is 232 and includes the years of 1916 through 1934. The gross maternal mortality was 69 deaths, or 21.1 per cent. The gross fetal mortality was 71 deaths, or 36.7 per cent, prematures and undelivered fetuses included. Our cases have been divided into a radical, conservative and intermediate group.

RADICAL GROUP

The radical group includes those cases treated primarily as surgical from 1916 through 1922: 60 cases with 19 deaths, or 31.6 per cent mortality.

(1) Sixteen cases were not operated upon:

Type	No. Cases
(a) Post partum with 3 deaths, or 18.7 per cent..	10
(b) Mild cases requiring little treatment.....	3
(c) Cases developing convulsions during delivery of head	3

(2) Forty-four cases were operated upon with 16 deaths, or a mortality of 36.3 per cent.

Operation	No. Cases	No. Deaths
(a) Cesarean section	30	10
(b) Version	4	3
(c) Forceps	7	3
(d) Bag inductions with manual dilatation	3	0

(3) Fetal mortality 18, or 30 per cent.

CONSERVATIVE GROUP

The conservative group includes cases treated primarily as medical from 1923 through 1929: 110 cases with 30 deaths, or mortality 27.2 per cent.

(1) Eighteen cases operated upon with 3 deaths, or 16.8 per cent.

REVIEW OF OPERATIONS

Operation	No. Cases	No. Deaths
(a) Cesarean sections	3	0
(b) Forceps	11	0
(c) Forceps	3	3
(d) Version	1	0

(2) Ninety-two cases with 27 deaths, or 29.3 per cent mortality.

Delivery	No. Cases	No. Deaths
(a) Normal	61	0
(b) Normal	8	8
(c) Undelivered	19	19
(d) Undelivered	4	Cured

(3) Nine patients died within 6 hours, eliminated as moribund by customary privilege.

(4) Three patients died within 6 to 10 days post partum, likewise eliminated.

(5) Eighty patients treated conservatively with 15 deaths, or 18.18 per cent mortality.

INTERMEDIATE GROUP

The intermediate group includes cases treated by surgical intervention, following failure of medical therapy from 1930 through 1934: 62 cases with 20 deaths, or mortality 32.2 per cent.

(1) Fifty-four cases with medical therapy only, 18 deaths, or 33.3 per cent.

MANAGEMENT OF CASES

Delivery	No. Cases	No. Deaths
(a) Spontaneous	25	7
(b) Post partum	15	2
(c) Undelivered	9	7
(d) Forceps	3	1
(e) Craniotomy	1	1

(2) Corrected mortality, 46 cases with 10 deaths, or 21.5 per cent.

Cause of Death	No. Deaths
Moribund on admission	5
Craniotomy, *B. welchii* infection	1
Post partum, from pneumonia	1
Post partum, medical	1

(3) Eight cases, failure medical therapy, operated upon, 2 deaths.

Surgical accident	1
Misuse of deflation apparatus	1

(4) Corrected mortality for entire series, 44 cases with 8 deaths, or 18.1 per cent.

(5) Intermediate therapy should have saved at least 5 cases of 14 in "only medical therapy" group if 6 cases were saved out of 8 operated upon.

It is apparent that until 1922 eclamptic therapy was looked upon primarily as surgical and from 1922 to 1930 as primarily medical. The conclusions were that although mortality under medical treatment was definitely lower than under operative treatment, it was still discouragingly high. The invariable use of either method has unquestionably delayed a more rational plan of adequate eclamptic therapy. The corrected mortality was 18.18 per cent in the group treated medically against 36.2 per cent in those operated upon. It was evident that the 19 patients who died undelivered under medical therapy must be considered by those who treat the condition *per se* and ignore the pregnancy; for the condition of the patient, the anesthetic and the lack of general surgical judgment may have been responsible for the high mortality in the operative series rather than the disease itself. The uncorrected mortality was almost the same, 36 per cent for the radical and 27 per cent for the conservative. It is apparent that the problem of managing eclampsia should not always be regarded as a medical one, but that the question of emptying the uterus requires definite consideration.

This principle was attempted during the last five years. As a whole, the death rate still remains too high. A review of these cases indicates that our service failed to adhere to the plan of therapy proposed in a report of 1929. The feasibility of this plan is evidenced by the falling death rate in the last three years, since it has been more carefully employed. The service accepts the responsibility for not appreciating the limitations of medical therapy.

It is apparent that other uncontrollable factors, rather than the therapy alone, contribute their part in the mortality. This difference in mortality between supervised and unsupervised cases cannot be discredited because one death occurred in every 62 cases on the 1,041 nonclinic patients, while only one death occurred in every 2,000 cases of the 8,709 clinic patients. The majority of these patients are Negroes suffering with nutritional diseases resulting from economic distress. They live in remote sections where no medical care is available. Therefore, the lack of transportation or the distance delays hospitalization. This delay makes for long duration of the disease before medical therapy is instituted. We have demonstrated unquestionably that the necessary, rapid response to therapy is in ratio to the hours which have elapsed since the onset; for patients receiving immediate therapy show a lower death rate. We feel that adequate eclamptic therapy cannot entirely reduce the mortality until these uncontrollable factors are rectified, but many of these patients can be saved by the adoption of intermediate methods.

DEDUCTIONS CONCERNING CARE OF ECLAMPTICS

(1) Medical treatment is indicated in every case and will suffice for the greatest number. This permits many cases to be carried to term.

(2) Rigid adherence to medical therapy should be supplanted by surgical interference upon the failure of immediate response. We should not wait until the patient is moribund.

(3) Improvement should be noted in from two to four hours after treatment is begun.

(4) The duration of the illness after its onset before therapy influences the patient's chance to respond.

(5) The small percentage of cases uncontrolled by medical therapy are better surgical risks because of their treatment.

(6) Experienced and constant observation are required for one to recognize the limit of effectiveness of medical therapy.

(7) A very definite syndrome suggests the indication for surgical intervention. This syndrome has been designated as "the break."

(8) The pregnancy must be terminated by the method which produces least shock and trauma.

(9) Inhalation anesthesia should be supplanted by local perineal infiltration and nerve block for vaginal delivery when the cervix is completely dilated.

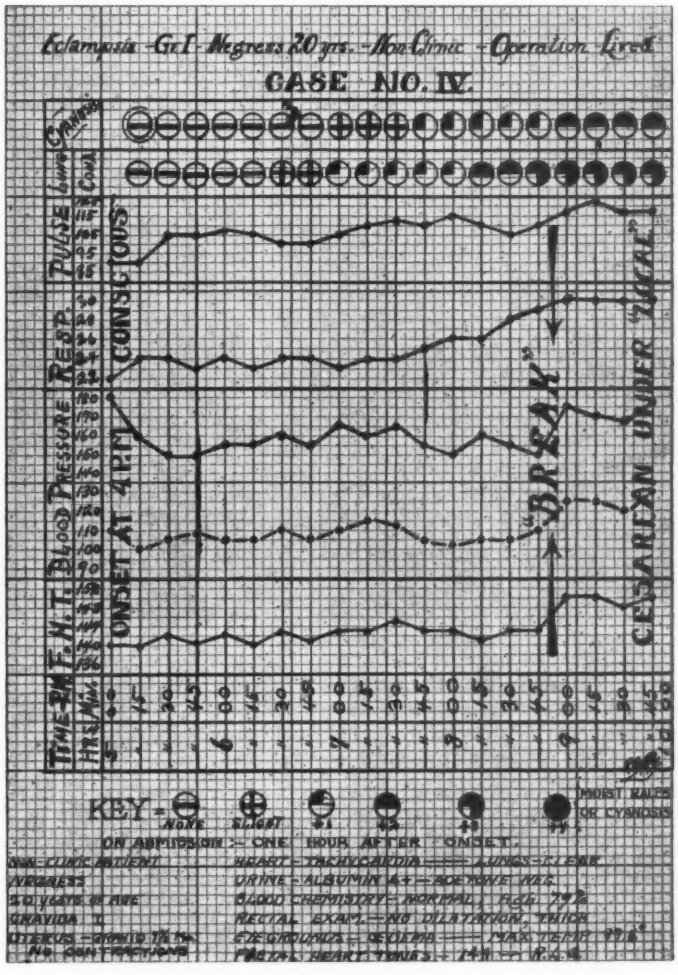
(10) In all other cases cesarean section has become more generally employed and should be done under local or spinal anesthesia.

CONCLUSION

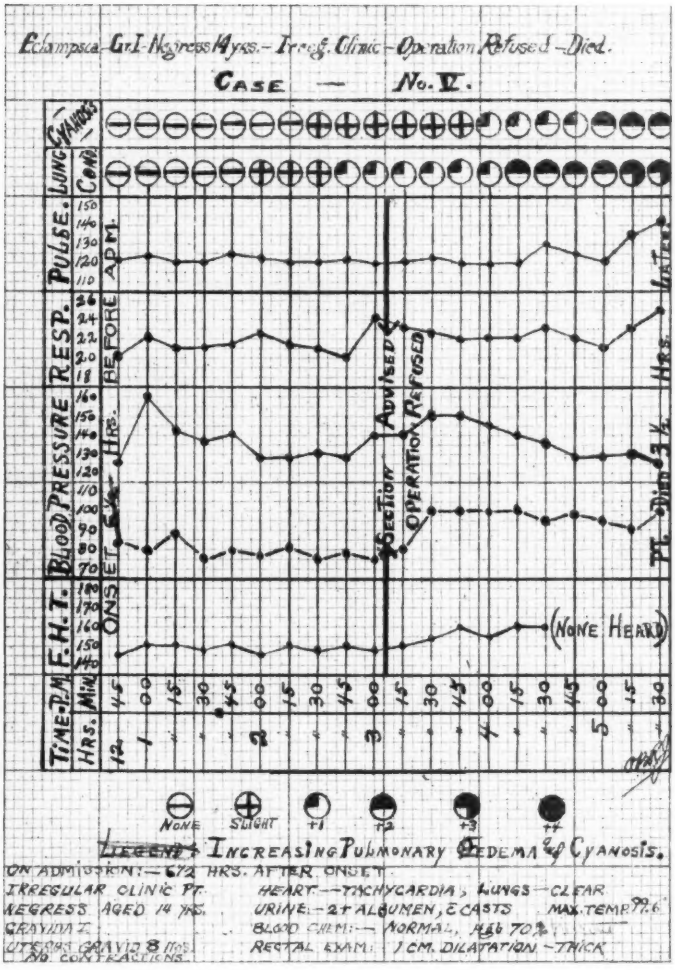
Intensive research is doing much to rationalize the present standards of therapy. The problem of the eclamptic is still an individual one. The consistent use of either medical or surgical measures accounts in a large measure for the sustained mortality. It is felt that the intermediary approach to this problem will ultimately prove best.

A small group of cases is appended to demonstrate the importance of effective eclamptic therapy:

Case 1.—A white primipara, aged seventeen years, 7½ months pregnant, non-clinic, was admitted to the hospital after having had five convulsions. Her blood pressure was 140/80, and it rose within 50 minutes after admission to 180/100. Her respiratory rate was well elevated. Her pulse rate was 110. Urine showed albumin 4 plus. She was given the usual medical therapy. Convulsions were controlled. She was kept under observation in the hospital for 18 days and was permitted to go home, but returned for observation at frequent intervals. She returned to the hospital 31 days after her initial convulsive seizure in active labor. Blood pressure, pulse and respiratory rate were elevated during labor. No subsequent convulsions occurred. The delivery of a normal living baby was accomplished by prophylactic low forceps and left mediolateral episiotomy. Her puerperium was uneventful.



Graph 1, Case 4



Graph 2, Case 5

It is not good practice generally to permit eclamptics to leave the hospital before delivery, because many of them return to the convulsive state and do not respond again to medical therapy.

Case 2.—A colored primipara, aged 16 years, full term, non-clinic, was admitted to the hospital with a history of having had nine convulsions. Her blood pressure was 180/95. The pulse rate was 36. The respiratory rate was elevated. She was in active labor and was given the usual medical therapy. Convulsions were controlled. The delivery of a normal male child was accomplished by prophylactic low forceps and left medio lateral episiotomy. The puerperium was uneventful and the patient was discharged at the end of 14 days.

This case serves to demonstrate the effectiveness of medical therapy in the face of active labor.

Case 3.—A colored primipara, aged 17 years, full term, clinic case, was admitted to the hospital in active labor. She had been a toxic case in the hospital, but had signed out and did not return to the clinic for observation. The delivery of a normal living baby was accomplished by prophylactic low forceps and left medio-lateral episiotomy. She had three convulsions in the first 24 hours after puerperium. The convulsions were controlled and the patient discharged at 11 days.

The literature indicates that this is the most serious type of eclampsia. But this has not been our experience, for there were 30 cases of this type in the first 170 cases reported, with no deaths. All toxic patients should have preventive treatment during labor and for the first 72 hours of the puerperium.

Case 4.—A colored primipara, aged 20 years, 7½ months pregnant, non-clinic, was admitted to the hospital with a typical eclamptic history of one hour's duration. Medical therapy was instituted, but "the break" was evidenced after five hours of treatment. By cesarean section under local anesthesia a living baby was delivered. The patient made an uneventful recovery and was discharged from the hospital in 14 days.

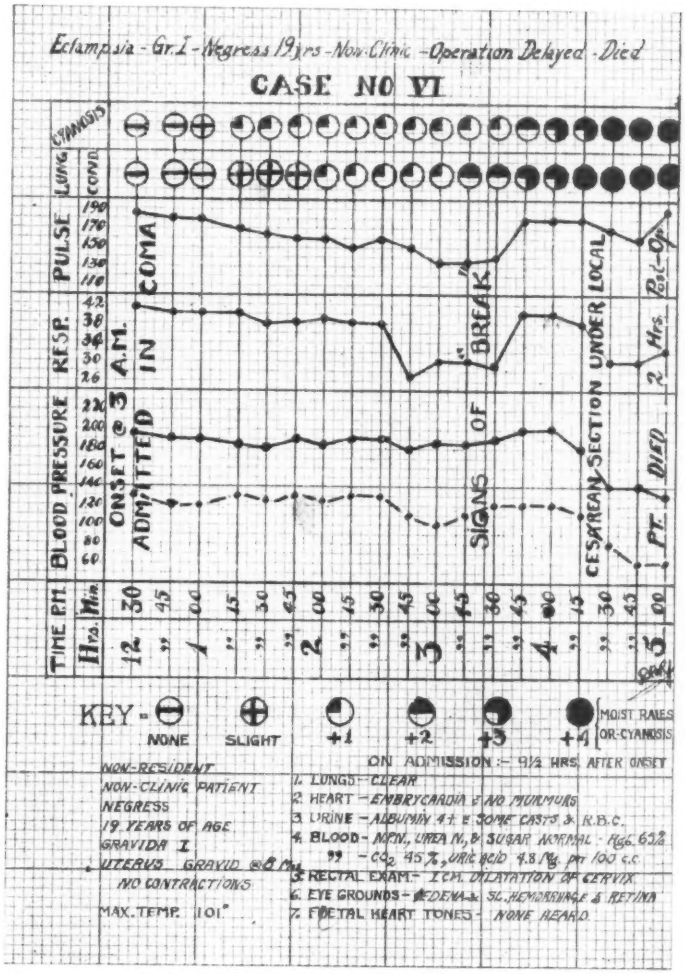
In this case, the short duration of the illness and the early recognition of "the break" resulted in the immediate successful termination of the pregnancy for the good of both mother and baby.

Case 5.—A colored primipara, aged 14 years, 8 months pregnant, a clinic case, was toxic, but failed to return

for a period of three weeks for examination, even though requested to do so. She was admitted to the hospital with the history of having had three convulsions before admission. She was conscious with a blood pressure of 125/80, pulse rate of 120 and respiratory rate of 20. The usual medical therapy was administered and after three hours an evidenced "break" occurred. A cesarean section was advised, but refused. Medical therapy was continued, but the patient died.

Case 6.—A colored primipara, aged 19 years, 8 months pregnant, non-clinic, was admitted to the hospital in coma with a typical eclamptic history of 9½ hours' duration. Her condition was considered serious. Medical therapy was administered and the patient continued to improve for four hours. The signs of a definite "break" were evidenced, but the operation was delayed. The patient died two hours after the signs of "the break," or one hour after the operation.

The long duration of the disease and the critical condition probably accounted for the lack of response. The operating room should be ready at a moment's notice.


Eclampsia - Gr. I - Negress 19 yrs - Non-Clinic - Operation Delayed - Died
CASE NO VI
CYANOSIS
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Pul-Op.
2 Hrs.
DIED
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KEY - NONE SLIGHT +1 +2 +3 +4 MOIST RALES OR CYANOSIS
ON ADMISSION :- 9½ HRS. AFTER ONSET
NON-RESIDENT
NON-CLINIC PATIENT
NEGRESS
19 YEARS OF AGE
GRAVIDA I
UTERUS GRAVID @ 8 Mos.
NO CONTRACTIONS
MAX. TEMP. 101°
1. LUNGS - CLEAR
2. HEART - ENBRYCARDIA & NO MURMURS
3. URINE - ALBUMIN 4+ & SOME CASTS & R.B.C.
4. BLOOD - NON. UREA N, & SUGAR NORMAL : Hgb. 65%
" - CO_2 45.% URIC ACID 4.8 Mg per 100 c.c
5. RECTAL EXAM. - 1 CM. DILATATION OF CERVIX
6. EYE GROUNDS - EDEMA & SL. HEMORRHAGE & RETINA
7. FOETAL HEART TONES - NONE HEARD

Graph 3, Case 6

DISCUSSION (*Abstract*)

Dr. G. D. Royston, St. Louis, Mo.—Dr. Reinberger's report shows that he has an unusually severe type of eclampsia occurring among a very poor class of people, and the mortality under such conditions will be high regardless of the treatment. The simplified classification presented impresses me as being both practical and valuable.

The blood pressures herein presented are rather lower than I have found among my patients whom I considered normal. Some two years ago, I reported average blood pressure readings among two thousand consecutive private patients and two thousand consecutive clinic patients delivered in the Washington University Clinic. These averages were obtained by determining the highest and lowest blood pressure in all three trimesters of pregnancy. Among the two thousand consecutive private patients, there were five cases of eclampsia with no deaths. Among the two thousand consecutive clinic patients, thirteen had eclampsia with one maternal death and that one had had no prenatal care. It is my belief that the low blood pressure that is commonly given as the normal standard is more frequently due to malnutrition or occurs in patients with low thyroid function.

Acidosis in eclampsia, I believe to be temporary and due to lactic acid formation associated with convulsions. A low carbon dioxide plus a low pH must be found before we can consider the case one of true acidosis. The acetone and diacetic acid found in the urine are more frequently due to ketosis, and we feel that injections of bicarbonate of soda are contra-indicated since the production of alkalosis is as undesirable as a pronounced acidosis.

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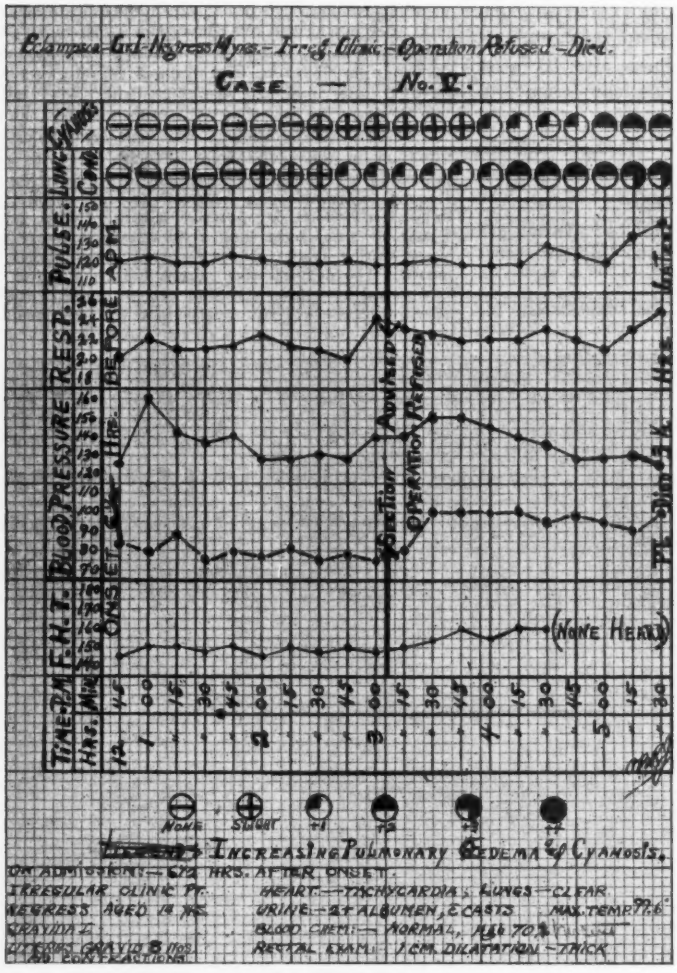

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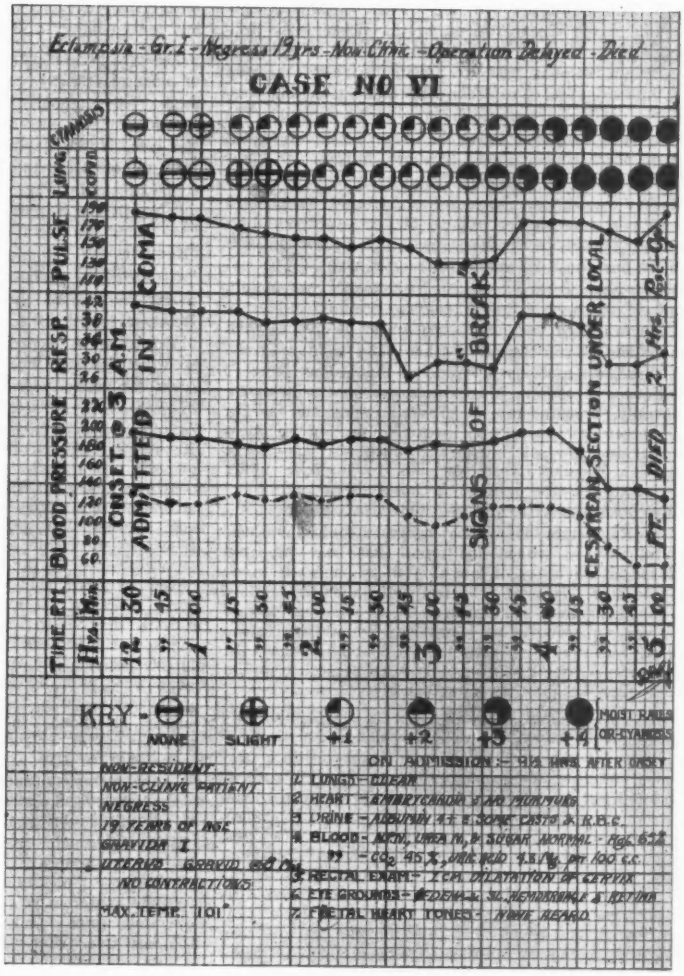
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It is my belief that many instances of so-called

postpartum eclampsia are due to the anesthetic employed. As to the treatment, in the Washington University Clinic we give the eclamptic patient 25 per cent magnesium sulphate 10 c.c. intramuscularly for the first injection, and 5 c.c. following each succeeding convulsion until the convulsions are under control. We also give 20 per cent glucose 1000 c.c. intravenously two to three time daily to promote diuresis. In cases of marked edema and high blood pressure when it is felt that the larger volume is less desirable, we give 30 to 50 per cent glucose 100 to 300 c.c. intravenously. Diuresis should be stressed since increased diuresis is one of our most favorable prognostic signs. The patient is also given 60 c.c. of 50 per cent magnesium sulphate by mouth and a colonic flushing to empty the colon. Ten per cent karo water is given when the patient is conscious and when fluid is found passing through the stomach. We feel that saline, Ringer's solution, and sodium bicarbonate are contra-indicated. Naturally, prenatal care is of vital importance as Dr. Reinberger has shown, and in this connection we stress low fat and low salt intake and much rest, and if the condition becomes worse or fails to improve under this treatment the patient is hospitalized and given intravenous glucose to promote diuresis.

Dr. Reinberger is to be congratulated upon the careful way in which this report has been prepared and for his advocacy of adopting an intermediate mode of procedure. However, we feel that under the method of treatment that we ourselves use the patient should be given some twelve to forty-eight hours' time before radical measures are instituted. We realize that Dr. Reinberger's cases had frequently been neglected for an undue time before they came under his care.

Dr. Vance H. Bell, Cleveland, Tenn.—Dr. Reinberger's mentioning the use of intravenous glucose solution reminds me of a case of pre-eclamptic toxemia with pernicious vomiting, seven months pregnant. This patient, a colored girl 18 years of age, passed into a semi-comatose condition. It was decided that she had acidosis and the proper thing to do was to give her sodium bicarbonate solution combined with glucose intravenously. Therefore I started an intravenous injection of 0.5 per cent sodium bicarbonate solution combined with 10 per cent dextrose, intending to give 1000 c.c. By the time I had given this injection the patient was completely comatose. Giving up in disgust, I immediately started an infusion of normal saline solution and left the ward. Two or three hours later the patient was sitting up in bed, in much better condition than she had been for several days.

During the following night she began to sink into a semi-comatose condition again. Concluding that the body was again depleted of bicarbonate or alkalis, we decided that 2,000 c. c. of sodium bicarbonate glucose solution should be given. By the time 1500 c.c. had been injected she made her exodus.

Later I concluded that my patient had had alkalosis instead of acidosis.

It is always difficult to differentiate acidosis from alkalosis. Today we are fortunate in having on the market a fool proof solution known as Hartman's solution. It contains the different minerals of the blood, including calcium, phosphorus and potassium that makes it unnecessary to determine the carbon dioxide combining power of the blood. Hartman's solution will combine with either acid or alkali to restore the normal hydrogen ion concentration of the blood.

Dr. Reinberger (closing).—The discussion of therapy of eclampsia always produces a wide variation in opinions. We personally feel that other factors than the treatment itself play as great a part in the outcome of the case. It so happens that most of our cases come from remote areas and oft times too late for any therapy to be of avail. The long period of illness prior to admission to the hospital is of importance, economic distress being the factor responsible for the lack of early attention.

There seems to be a difference of opinion as to the blood pressure of the normal pregnant woman. Dr. Royston found in a rather extensive study that his blood pressure records were much higher than those recorded by us. The observation of low blood pressures for many years prompted our early recognition of mild cases. It seems again that our observations on complications of acidosis are at variance with Dr. Royston's. Our service made an intensive study of acidosis and alkalosis complicating pregnancy. We concluded that aside from the starvation and dehydration acidoses the majority of cases seen were due to lactic acid accumulation. We observed that simple dehydration and starvation acidosis could be relieved by the administration of fluid, but that the intoxication produced by lactic acid accumulation could not be overcome so easily. It was then deemed advisable to find a safe and effective therapeutic agent that would diminish the acidosis. We produced acidosis and alkalosis experimentally in dogs by various means. These dogs were partially or completely resuscitated by the intravenous administration of one per cent solution of sodium bicarbonate in 500 c.c. amounts in acidotic dogs and the administration of a one per cent solution of lactic acid in 500 c.c. amounts in dogs with alkalosis. It then seemed rational to extend the bicarbonate of soda therapy in certain severe acidotic eclamptics and it has proven of great value.

We do not advocate operation nor does Dr. Royston in cases of eclampsia. However, we disagree with him when medical measures have failed. We have been extremely conservative in that very few cases have been operated upon. Only eight of sixty-two patients in the last five years were operated upon, following the failure of medical therapy. It is an erroneous prediction that the patient will die if operated upon after medical therapy has failed. Only two of the patients died and these not from the operation itself. One died from a slipping of a ligature on the uterine artery following a Porro cesarean section which probably should not have been done. In a second case, the misuse of the deflation apparatus by a junior intern, flooded the patient's lungs with fluid which resulted in death. It is evident that we were not over-enthusiastic nor had we lost sight of the nineteen patients who died undelivered in the absolutely conservative series of one hundred and ten cases in the second period of our study.

I am glad to hear Dr. Schwarz substantiate our conclusions that a small percentage of cases ultimately has to be operated upon following the failure of medical therapy. We feel that the use of colonic irrigations many times stimulates additional convulsions without giving any material benefit.

INTERSTITIAL PREGNANCY*

CASE REPORT

By T. M. BOULWARE, M.D., F.A.C.S.
and
W. L. WILLIAMS, M.D.
Birmingham, Alabama

The interstitial type of ectopic gestation occurs very infrequently. Because the operative specimen in this case beautifully illustrates this relatively rare lesion, a brief report of the case and specimen was considered warranted.

K. M. B., a married Negress, aged 19, was referred to the clinic November 12, 1935, with complaints of pain in the right lower abdomen and vaginal bleeding. Her past history was essentially negative and there had been no pregnancies. Her menstrual history had been regular until six weeks before admission. At that time she completely missed her expected flow. Nausea and urinary frequency began about ten days later. Three weeks prior to admission she began having a dull intermittent pain in the right lower quadrant. Nausea continued, but the patient did not vomit. Two weeks before her admission vaginal bleeding began and continued. The flow was never as profuse as that experienced with her regular menstrual periods.

Abdominal examination showed only moderate tenderness in the extreme lower right quadrant. No unusual mass or muscle spasm was palpable.

Pelvic examination revealed a bloody discharge from the cervix. This latter structure was definitely softer in consistency than would be expected. The corpus uteri was seemingly enlarged to one and one-half its normal size and a firm, fusiform, tender, slightly movable mass about the size of a large walnut was palpable in the region of the right appendage. This mass seemingly was immediately adjacent to the uterine cornu and apparently was tubal. No masses were felt in the left adnexa.

Preoperative diagnosis: the above history and pelvic findings strongly suggested ectopic pregnancy. From the history of only dull pain we were of the opinion that tubal rupture or abortion had not yet occurred. The patient was sent to the hospital with a tentative diagnosis of ectopic pregnancy, right.

The only additional positive finding after complete hospital work-up was a 4 per cent eosinophilia in the differential white cell count.

Operation November 13, 1935, showed the corpus uteri rather small. The right cornu was enlarged 1½ to 2 times the size of the corpus and was soft to palpation. It was bluish in color. A point on the anterior surface was quite thin. Both appendages appeared normal except for the fact that the right tube was apparently involved in the cornual mass. A large corpus luteum was present in the left ovary. Because of the apparent location of the pregnancy and the thinness of the uterine wall, hysterectomy was done.

Gross Description.—A uterus 4.5 cm. long and 7.5 cm. wide at the fundus is amputated at the cervical junction. It is enlarged laterally by a soft tumor mass projecting from one side of the body and covering the tube attachment ahead of it. The mass is 4 cm. in diameter. The posterior surface of the mass is bluish red and fluctuant. On section the uterine cavity is found to be of normal size. The endometrium does not appear abnormal to gross inspection. The right tubal lumen can be followed for a distance of 3 cm. upward and outward over the surface of the mass. At 3.5 cm. the lumen of the tube is lost and the dull red surface of the tubal mass is exposed. Tangenital sections throughout the anterior wall reveal a placenta with embryonic sac containing the embryo situated within the myometrium. The embryo is about 8 mm. long.

Gross diagnosis (by Dr. G. S. Graham, pathologist) is interstitial pregnancy.

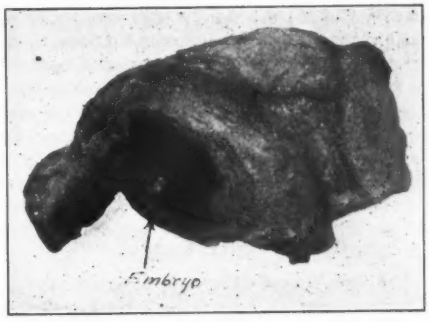

Fig. 1
Photograph showing relationship of uterine cavity to gestational cavity in myometrium proper. Figure does not show extreme thinness of posterior wall of gestational cavity.

A study of the gross specimen confirmed the opinion expressed at time of operation, that eventual rupture through the serosal uterine surface would have occurred.

The preoperative differential diagnosis of interstitial tubal pregnancy and cornual pregnancy may be most difficult. A careful history will be of much more differential value than pelvic examination, as the latter may give almost identical findings before operation.

2501 North Sixteenth Avenue

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*From the Norwood Clinic and Hospital.

RECENT RESEARCH UPON THE MALARIA PLASMODIA*

By HENRY E. MELENEY, M.D.†
Nashville, Tennessee

HUMAN MALARIA

Plasmodium ovale has again received considerable attention during the past year.

Giovannola[1] (1935) presented a paper before the National Malaria Committee in 1934 in which he presented evidence suggesting that *P. ovale* is a modification of *P. vivax* produced by long residence in the human host. He pointed out that both in cases of chronic infection with *P. vivax* and in inter-human passage of the same strain modifications are observed which produce a morphology practically indistinguishable from the usual description of *P. ovale*.

A note by James, Nicol and Shute[2] (1935) which immediately follows Giovannola's paper in the *American Journal of Tropical Medicine* reaffirms their belief in the specificity of *P. ovale* on the basis of (1) morphology in the human host and in the mosquito; (2) maintenance of the morphology after repeated passages through the insect and human hosts; (3) immunological differences; and (4) the clinical course of the infection. (The reviewer believes that these points require further strengthening before the specificity of *P. ovale* can be universally accepted. Immunological differences cannot be used as a criterion because it is well known that different strains of the same species of malaria parasite are immunologically different; that is, that infection with one strain does not always protect from subsequent infection with another strain.)

Wilson and Wilson[3] (1935), in a malaria survey in the northern part of Tanganyika Territory, discovered twenty-seven cases of malaria which they diagnosed as *P. ovale* infections. All except one patient were natives of the region and none was clinically ill. The age distribution was about the same as in *P. vivax* infections except that *P. ovale* was relatively more common in adults. The parasites were relatively impermanent in the blood of untreated persons. The typical oval red blood cells were always in the minority. There was slightly less enlargement of the red blood cells than in *P. vivax* infections and gametocytes were more frequent. The authors state that they have learned to diagnose *P. ovale* in thick films by the size, compactness, large prominent chromatin, and somewhat inconspicuous brown pigment. They state that "unless parasites are present in fairly large numbers the differentiation of these two species may be quite impossible."

The sporozoites of the various malaria parasites have also received attention. Boyd[4] (1935) states that there is considerable variation in the size and shape of the sporozoites of all three species of human malaria and that they vary within such wide limits that attempts at identification of species on morphological grounds would be unreliable.

Giovannola[5] (1934) recommended the addition of brilliant cresyl blue to the salt solution used in mosquito dissection as an aid in distinguishing the salivary glands from fat and in identifying the sporozoites without destroying their motility.

Raffaele[6] (1934a) injected sporozoites of *P. vivax* from mosquitoes intravenously into man and produced a typical malarial attack 15 to 17 days after inoculation.

Missiroli and Mosna[7] (1934) applied the so-called "nuclear reaction" to the study of *P. vivax*. This reaction, first described by Feulgen, employs fuchsin-sulphurous acid combined with partially hydrolized thymo-nucleic acid, demonstrating the presence of nucleinic acid. This reaction was found to be positive in all stages of development of *P. vivax*, both in the human host and in the mosquito except in the undeveloped schizonts.

Lowe[8] (1934) made numerical studies of *P. vivax* and *P. falciparum* in cases of untreated malaria. He found that in *P. vivax* infection a minimum of 500 parasites per cu. mm. of blood was usually necessary to cause fever, whereas in subtertian from 600 to 1,500 parasites per cu. mm. were necessary to cause fever. The variations in the number of vivax organisms in any given patient appeared to be due to their multiplication and destruction and not to variation in their distribution in the body as he found in *P. falciparum* infections. In *P. vivax* infections the largest increase in parasites immediately after schizogony was nine times, but it usually was much less because 50 to 100 per cent of merozoites failed to infect new red blood cells. On the average only 20 per cent of the young trophozoites matured to schizonts. In falciparum infections there were wide and frequent fluctuations in number due to the "migration of mature parasites to the internal organs and to flooding of the blood with young parasites from these organs." (The reviewer has recently found from the examination of sections of the skin and subcutaneous tissue from patients dying of estivo-autumnal malaria that the plugging of small blood vessels by malaria parasites is just as striking a phenomenon in these regions as in the internal organs. He believes, therefore, that the idea that the red cells containing asexual forms of *P. falciparum* migrate only to the internal organs is erroneous and that all the capillaries of the body are equally affected by them.)

De Buck[9] (1935) described morphological differences between two strains of *P. vivax*. He[10] also (1935a)

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†Associate Professor of Preventive Medicine and Public Health, Vanderbilt University School of Medicine.

studied a "Vienna" strain of *P. malariae* and found that gametocytes were small in number and that the male gametocytes were more numerous than the female. He suggested that in such cases the female gametocytes should be counted instead of the male gametocytes as is usually done in estimating the value of blood for infecting mosquitoes. He described the first experimental transmission of *P. malariae* by *Anopheles maculipennis* var. *atroparvus*.

MONKEY MALARIA

Brug[11] (1934) made a very careful study of *P. knowlesi* and *P. inui* in *Macacus rhesus* monkeys. In *P. knowlesi* he described two morphological features not given in the original description by Sinton and Mulligan: (1) the nuclei of the young parasites were usually surrounded by an unstained halo; (2) many "band forms" were found in certain parts of some of his thin smear preparations. These forms were very irregular in distribution, usually in streaks in the thinnest portion of the film where drying had been most rapid. He mentioned a similar phenomenon in a blood specimen of *P. falciparum* malaria sent to him by Schüffner. The author made a careful study of the multiplication of parasites in the host. Schizonts contained six to twelve merozoites, usually eight. The enormous multiplication of parasites in the peripheral blood within a few days after a period of slow increase indicated that a considerable portion of the multiplication must have taken place in the internal organs. At the same time he estimated that there must have been a tremendous loss of parasites through failure to infect new red blood cells and through the destruction of developing trophozoites. He also showed that in four days as many as four million red blood cells per cubic millimeter were destroyed, and since this was a much greater loss than the number of parasitized red cells, he suggested that red cell destruction was partially due to a toxin produced by the parasites. He found that all the red cells which contained basophilic stippling contained parasites, whereas only 35 per cent of other red blood cells were infected and suggested that the young red blood cells were more attractive hosts to the parasites than older red blood cells. He created a new variety, *P. knowlesi* var. *sintoni*, for a strain in which the pigment was in rods instead of in granules. The parasitized red blood cells rarely showed distortion and fimbriated protuberances as in *P. knowlesi* and the parasites showed bright purple stained borders which in the mature schizonts extended in septa between the developing merozoites. *P. inui* in *Macacus rhesus* monkeys produced a mild infection with a low rate of multiplication and a probable tertian periodicity. Schüffner's dots were inconstant, but he sometimes found in the red blood cells a few bright red dots and lines close to young parasites.

Schwetz[12] (1934) found in a young chimpanzee caught near Stanleyville, Belgian Congo, two species of malaria parasites morphologically like *P. vivax* and *P. falciparum*.

BIRD MALARIA

Manwell[13] (1935) described *P. vaughani* as a valid species identical with *Haemamoeba tenuis* of Laveran and Marullax, 1914. He described the species as common in robins in North America and found also in the catbird. Canaries are readily susceptible to infection, although probably less so than to other species of avian malaria, and the parasite is only slightly pathogenic in these birds. Morphologically *P. vaughani* is very close to *P. rouxi*, but produces a quite different type of infection in the canary.

Manwell[14] also (1935a) discussed the various species of bird malaria and stated that up to the time of writing only seven of the ten species have been sufficiently studied to make their existence as valid species reasonably certain. He listed the valid species as follows:

(a) Having round gametocytes, *P. cathemerium*, *P. praecox* (*relictum*).

(b) Having elongated gametocytes, *P. circumflexum*, *P. elongatum*, *P. nucleophilum*, *P. rouxi*, and *P. vaughani*.

He stated that morphological characteristics alone are not always sufficient to distinguish species, but that one must also know their behavior in the host and their immunological relationships.

Huff[15] (1935) described *P. hexamerium* as a new species from the bluebird, also found in Maryland yellowthroats, catbird, and mourning dove. Morphologically it is very close to *Haemamoeba tenuis* (*P. vaughani* of Manwell). Its periodicity has not been determined, but is probably tertian or quartan. It produces six (4 to 8) merozoites. Its gametocytes are elongated, extending from pole to pole of the red blood cell.

Several studies have been made of sporozoites of bird plasmodia. Raffaele[16] (1934) attempted to infect canaries with sporozoites of *P. praecox* from the glands of Culex mosquitoes by intravenous and intracardial inoculation. No infection occurred. The author concluded that infection from sporozoites would not take place directly into circulating red blood cells. He later found, however (see above) that infection could be produced by similar inoculation of *P. vivax* into men.

Ferreira[17] (1934) described the morphological changes which take place in the protoplasm and nucleus of sporozoites of *P. praecox* after inoculation into canaries by the bites of Culex mosquitoes. These changes include enlargement of the chromatin mass into a ring form, division into two separate masses, and subsequent division into a number of granules. The cytoplasm of older sporozoites becomes swollen and takes an acidophilic stain.

Missiroli[18] (1934) confirmed his previous observation that scission takes place in the sporozoites of *P. praecox*

before they penetrate red blood cells. He found also that the sporozoites leave the point of inoculation in the canaries through the lymphatic vessels within one to five minutes.

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SOME RECENT ADVANCES IN THE EPIDEMIOLOGY OF MALARIA*

By GEORGE E. RILEY, M.D.**
Jackson, Mississippi
ERNEST CARROLL FAUST, PH.D.†
New Orleans, Louisiana
and
S. S. COOK, M.D.‡
Washington, District of Columbia

The Sub-Committee on Epidemiology has adhered to the practice of former years in confining its report to studies outside the continental United States. Many of the articles which have appeared in the literature since early 1934 cannot be adequately reviewed and must be read in the original. Included in this category are the *Records of the Malaria Survey of India*, the *Proceedings of the Far Eastern Association of Tropical Medicine* and annual reports of health officers in various tropical countries.

An epidemic which attracted world-wide notice was that of Ceylon in 1934-35. According to Dickson,[1] this was the largest and worst of which the Island has record. The affected area was within the southwest quadrant or wet zone of the Island. It comprised approximately 5,000 square miles and contained about 3,500,000 persons. There were no infections recorded at altitudes above 2,400 feet.

A prolonged drought prevailed from May to October. The rivers dried up except for pools in their beds. Rains in October filled borrow pits, quarry pools and other potential breeding places. These conditions provided for enormous multiplication of *A. culifacies*, the principal if not the sole vector of the Island.

Early in October there was an increase in dispensary attendance and thereafter a progressive increase in the daily attendance until the peak of the epidemic in the third week of December. It was estimated that about one-half million people suffered from the disease and about 40,000 died. In addition to the malaria epidemic the drought caused a failure of the rice crop in many places with resulting destitution and lack of food. *P. vivax* was the predominating parasite.

The common complications were a dysenteric form of diarrhea, convulsions in children, and during convalescence, edema of the face and feet.

The case fatality rate was not high. Thus among 2,233 hospital patients in one district there were 64 deaths, a rate of 2.87 per cent.

Attention is invited to a description of conditions in Mauritius by Kirk.[2] Mauritius is a volcanic island in the South Indian Ocean with an area of 716 square miles and a population of about 400,000. The island experienced a severe epidemic of malaria in 1867, during which one-fifth of the population died. The principal town of the island is Port Louis, which had, in 1867, a population of 87,000. In April of that year 6,224 of the inhabitants died of malaria.

The town of Port Louis is situated on the floor of a bowl-like formation of country. The only outlet for the water from the hills to the south is through the town. At times of heavy rainfall the dry stream beds become raging torrents which subside in a few days, leaving numerous potholes that serve as ideal breeding places for *A. costalis*. Another source of mosquitoes arises from the municipal water supply. For reasons not explained by the author, provision is made for a daily supply of over 100 gallons of water per capita. This results in much wastage and formation of marshy areas. The high incidence of malaria has caused all of the population, except the poorest classes, to abandon the town and move into the neighboring hilly country.

The common vector is *A. costalis*, and *P. vivax* is somewhat more frequently found than *P. falciparum*. *P. malariae* is said to be rare.

Copeland[3] reports that the Muruts of North Borneo are being exterminated by malaria. Here there are two ancient types of people: the Dusuns, who live in the upland country and are farmers; and the Muruts, who live in the jungle and make a living by hunting and fishing. The incidence of malaria is high among the Muruts, but until 1925 had been chiefly of the benign

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**Mississippi State Board of Health.
†Department of Tropical Medicine, Tulane University School of Medicine.
‡Medical Corps, United States Navy.

type which the natives tolerated well. There was a large influx of Javanese in 1925, which was followed by clearing of jungle, planting of rice and the appearance of malignant tertian malaria. The report constitutes a striking example of what may happen when the living conditions of a primitive race are disturbed.

Thornton,[4] Chief Health Officer of the Union of South Africa, in his annual report for the year ended June 30, 1934, reports unqualified success in the employment of partially immune laborers from highly malarious areas in malarious sugar estates where non-immune laborers cannot be used. He thinks anti-malarial control is perfectly feasible in a native area provided that it has had a sharp epidemic as a preliminary and that methods of control are introduced tactfully. A native herbalist whose business was threatened by Government distribution of quinine adopted the expedient of obtaining a supply of quinine tablets, making a hole in each tablet and filling it with a mixture of soot and fat. He explained that the white tablets might be all right for the white man, but his tablets were far superior for the black man.

Attempts are made to forecast epidemics in the epidemic malaria areas by recording of rainfall data. Such records, over a period of years, have enabled the authorities to anticipate and make preparations for handling epidemics.

In thirty years' experience (Senevet and Collignon[5]), *A. hispaniola* had never appeared in Algeria before July. In this year (1933) it appeared in April. This shows that nothing is certain in malaria work.

Van Nitsen[6] reports the unusual condition in Katanga of high endemicity with very little illness from malaria. With a parasite index of 95 per cent in children between 3 and 4 years of age and a splenic index of 45 per cent between the ages of 4 and 5, the laborers and their children are well nourished and show comparatively little evidence of illness.

Sinton,[7] the Director of the Malaria Survey of India, convincingly presents the cost of malaria to India in a most interesting article which began in the September, 1935, issue of the *Records of the Malaria Survey of India*. Malaria is directly responsible for more than a million deaths each year and it is estimated that one death out of every 3.5 may be attributed to malaria.

Ganguli[8] summarizes a mosquito survey of Calcutta made between August 1, 1933, and July 31, 1934, as follows:

(1) *A. stephensi, A. sundaicus* and *A. varuna* are the only species transmitting malaria in Calcutta.

(2) *A. stephensi* is much more prevalent than the other two. The distribution of this species corresponds with the sewered area of the city.

Storage cisterns are responsible for 84.5 per cent of *A. stephensi* breeding. This species is most prevalent during the rainy season and least common in winter.

The amount of *A. stephensi* breeding depends not on the amount of rainfall, but on the number of rainy days in a month.

(3) *A. sundaicus* is at present confined to the eastern border of the city. It breeds mainly in tanks, and was responsible for an outbreak of malaria in Ward 29 in July, 1933.

(4) *A. varuna* is confined to the southern and southeastern parts of the city. Large tanks with marginal vegetations were the chief breeding places.

Walch[9] applied precipitin tests to Anopheles caught in houses in South Sumatra and found that *A. ludlowi* and *A. sinensis* are not diverted from man by the presence of cattle, but that *A. maculatus* and *A. aconitus* are so diverted. The figures as given in the abstract are:

"Where there are few cattle 94 per cent of *A. ludlowi* and 90 per cent of *A. sinensis* contained human blood. In places where there are plenty of cattle the figures were 86 per cent and 83 per cent. Where cattle were scarce 97 per cent of *A. maculatus* contained human blood as compared to 11 per cent where cattle were plentiful.

Morin[10] reports gratifying results in Indo-China in the reduction of malaria through the planting of shade trees and plants along the ditches and streams.

Sautet[11] reports that on the coastal plain of Corsica, where the mean winter temperature is 50° F., *A. maculipennis* does not go into complete hibernation, but does seek shelter in abandoned sheds and buildings. The few cases of malaria which occur in the winter are attributed by the author to the biting of individuals who enter these shelters.

A study of malaria in Greece made by Balfour[12] indicates that the disease is widespread, and among about 6,250,000 people there are between one and two million cases of malaria each year. According to official statistics, 5.6 per cent of the total deaths since 1921 have been due to malaria. He believes the blood examination of infants under one year of age is the most valuable comparative measure of new infections. The highest spleen rates were observed in the 5-14 year group and the highest blood indices in the 1-4 year group. The author's studies on spleen rates suggest that these rates are a measure of average conditions over the previous three or four years, whereas the blood picture is more susceptible to change and more nearly represents recent conditions. It appears that *P. vivax* and *P. malariae* are the more common parasites in endemic years, while *P. falciparum* is responsible for epidemics.

Helpern[13] describes an epidemic of malaria among drug addicts in New York City. In the period September 25, 1933, to February 8, 1934, there were recorded 41 cases of malaria in drug addicts. Among them there were 34 cases of estivo-autumnal malaria with 17 deaths and five cases of quartan malaria with 1 death. All of the cases occurred in heroin addicts, among whom it is the practice to inject the drug intravenously, the so-called "main line shooters." In a more recent article[14] the same author reports additional cases of malaria contracted in the same way. According to Helpern[13] this method of transmission was first described by Biggam[15] in 1929.

We wish to call attention to a significant contribution to our knowledge of the distribution of malaria and other tropical diseases. A grant from the American

Leprosy Foundation enabled the Division of Medical Sciences of the National Research Council to collect data regarding the prevalence of tropical diseases throughout the world. These data are published as a supplement to the *American Journal of Tropical Medicine* for September, 1935, in a separate volume entitled "A Geography of Disease." The map which shows the countries of the world where malaria is an important public health problem is based on the information referred to above. It is noted that the population of these countries amounts to 1,279,754,190.

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NOTES ON THE OCCURRENCE OF *A. WALKERI**

By H. A. JOHNSON†
Memphis, Tennessee

In connection with other activities during the late summer of 1935, Mr. J. A. LePrince and the writer noted an unusual prevalence of *A. walkeri* and this paper recounts the observation made on this species.

The place of study was at Walnut Log at the north end of Reelfoot Lake in northwest Tennessee, close to the Kentucky line. The area is a natural hunting and fishing ground. The lake is shallow with marginal growths of saw grass, lilies, smartweed, cyprus trees, and so on. The very heavy water growths are myriophyllum, ceratophyllum, water star grass and lilies. Large areas of densely overgrown marsh exist.

Working with a light trap and using a 100 watt mazda lamp, *A. walkeri* were first noted on August 14 and amounted to 15 per cent of the entire Anopheles catches. The percentage increased and by August 27, 50 per cent of the Anopheles caught in the trap were *A. walkeri*. Cooler weather then came and *A. walkeri* prevalence dropped off until September 8, after which none was caught.

From August 14 to September 12, inclusive, a total of 341 *A. quadrimaculatus*, 66 *A. crucians*, 8 *A. punctipennis* and 133 *A. walkeri* were caught in a light trap operated three nights each week for a period of fifteen minutes.

An unusually diligent search was made during this period for the daytime resting places of *A. walkeri*. Out of a total of 2,510 Anopheles taken in cow sheds, stables, chicken houses, under houses, open woods, tree trunks, stumps and in dense weeds, not a single *A. walkeri* was found.

On a screened balcony kept open and lighted at night for 12 nights, the following total catch was made (collected during the following day):

A. quadrimaculatus, 204
A. crucians, 8
A. punctipennis, 1
A. walkeri, 4

On August 27 two *A. walkeri* were caught resting on one of us while close to the operating light trap. In every instance where *A. walkeri* was captured the probable attractivity of light was very apparent.

Larvae were collected and reared from every available breeding area and on September 11 a female *A. walkeri* was bred from larva collected in a dense smartweed swamp. This specimen readily bit the writer the following day. All *A. walkeri* observed at Walnut Log were females.

A. walkeri have been reported from many scattered places, the latest one coming to attention being in Virginia. At that place catches of *A. walkeri* were made in July and August of 1934-35 by test tube and flashlight as they lit for biting.

A. walkeri are distinguishable from *A. quadrimaculatus* by the dull, sooty color of the thorax and by the dirty white rings at the joints of the palpi. Otherwise, they very closely resemble *A. quadrimaculatus* and are probably very readily mistaken for *A. quadrimaculatus*.

The Walnut Log observations may be summarized as follows:

(1) *A. walkeri* appear to be definitely attracted to lights.

(2) Its daytime resting places are unknown and its

*Read before National Malaria Committee (Conference on Malaria), meeting conjointly with Southern Medical Association, Twenty-Ninth Annual Meeting, St. Louis, Missouri, November 19-22, 1935.

†Past Assistant Sanitary Engineer, U. S. Public Health Service.

preferential breeding places have not been definitely ascertained.

(3) Possibly due to its willingness to bite humans; its unusual daytime resting habits; and its presumably unrecognized prevalence, *A. walkeri* may be shown to be of importance from a malaria standpoint. This of course is dependent on its being an efficient harborer of the malaria organism.

(4) It seems important to make further study of the life history of *A. walkeri.*

ON THE OCCURRENCE OF *ANOPHELES WALKERI* THEOBALD IN FLORIDA (DIPTERA, CULICIDAE)*

By G. H. BRADLEY†
Orlando, Florida

Anopheles walkeri, a comparatively rare species of mosquito, has been recorded from many widely separated localities in southern Canada and the eastern part of the United States. It has been reported from the Southern States of Virginia and Louisiana by Dyar[1] and from Louisiana by Komp.[2] This mosquito was first collected in Florida early in July, 1932, near Orlando by Mr. T. E. McNeel, who found a single female in a mosquito trap baited with a live rabbit. Later that season considerable numbers were included in collections made with a mosquito light trap in the same vicinity[3] and since that time specimens have been collected by others as far south in the State as Coral Gables. The Florida specimens are somewhat darker in color than northern material and have more distinct white markings at the apices of the femora and tibiae and at the joints and tips of the palpi. Komp[2] also has noted the dark color of the specimens collected by him in Louisiana.

In 1933, one lot of eggs was obtained from a female of this species, from which 30 mature larvae were reared. Attempts to collect the larvae in nature were unsuccessful until September of the present year (1935), when 8 larvae were found. A study of these, and of some later rearings, has shown that they are to be distinguished from the available larval specimens of *A. walkeri* collected in New York State by two characters, namely: the comparative sizes of hair No. 1 of the submedian prothoracic group and of hair No. 0 on abdominal segments of 2 to 6, inclusive.‡ In the Florida specimens hair No. 1 on the prothorax is usually almost twice the length of hair No. 3 on the same segment and branches widely from near the base (*Fig. 2*). In the northern larvae, hair No. 1 of the prothorax is of approximately the same length as hair No. 3, with weak branching near the tip (*Fig. 1*). Hair No. 0 on abdominal segments 2 to 6, inclusive, is quite well developed in the Florida specimens, is usually easily seen under low magnification, and has from 5 to 6 or sometimes 7 branches (*Fig. 3*). This hair is very small and inconspicuous on these segments in the northern specimens and is usually single or 2 to 3 branched (*Fig. 4*).

Eight male specimens were included in the rearings from the 1933 lot of larvae and 3 have been collected in the field, 1 of these by the light trap and 2 from a daytime shelter. The terminalia of these have been compared with those of northern specimens and no con-

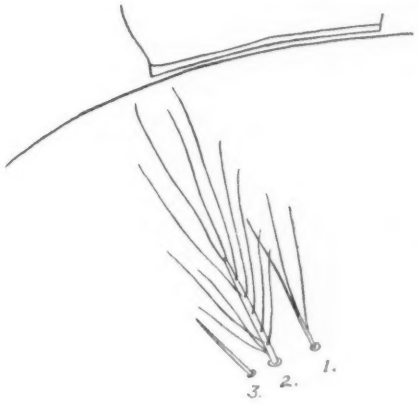

Fig. 1.

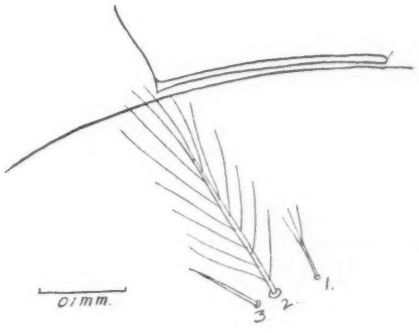

Fig. 2

Fig. 1
Dorsal submedian prothoracic hairs of *A. walkeri* (southern race).

Fig. 2
Same of *A. walkeri* (northern race).

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*Read before National Malaria Committee (Conference on Malaria), meeting conjointly with Southern Medical Association, Twenty-Ninth Annual Meeting, St. Louis, Missouri, November 19-22, 1935.

†United States Department of Agriculture, Bureau of Entomology and Plant Quarantine.

‡These distinguished characters were first noted and pointed out to the writer by Dr. W. V. King.

stant difference between the two has been found, although the following points are of interest. Dyar[1] and Matheson[4] state that the dorsal lobe of the claspette in *A. walkeri* has 2 clubbed rods fused at their bases, and this condition held true in 6 out of 7 New York specimens furnished the writer by Dr. Matheson. In the other specimens there appears to be only a single rod. Seven of the 8 reared Florida specimens have only a single rod; the other has a single rod on one side and a double rod on the other. The 3 field-collected males all show double rods. The number of pairs of mesosomal leaflets present in *A. walkeri* has been given by Matheson and Shannon[5] as 4 pairs; by Dyar[1] as 3 pairs; by Komp[2] as 2 to 4 pairs, and by Root[6] as from 3 to 4 pairs. In the 7 male specimens of northern *A. walkeri* available to the writer, the number of leaflets varies from 4 to as many as 6 pairs and the Florida specimens show a variation of from 4 to 7 pairs.

On larval characters, therefore, it appears that the Florida form represents a geographical race of the species. As previously mentioned, it differs somewhat in the adult stage, particularly when freshly caught, by its generally darker coloration and more pronounced white markings at the apices of the femora and tibiae and at the joints and tips of the palpi. No characters have been found in the male terminalia to separate it from the northern form.

Larval specimens of the southern race were collected in Florida from a marsh in which *Typha, Pontederia* and other aquatic plants were growing thickly, being in general similar to the breeding places of *A. walkeri* in the north. Larvae of *A. quadrimaculatus* and *A. crucians* were taken along with those of *A. walkeri* from this situation. Komp[2] collected *walkeri* larvae in Louisiana from water covered by water hyacinth, *Piaropus crassipes*, and also from a rice field which was watered from a deep well.

Small numbers of adult *A. walkeri* were found in Florida resting in the daytime under overhanging grass around the edges of a small pool located on the margin of the marsh from which the larvae were collected. Upon being disturbed the females flew out readily into the daylight and attempted to bite. The writer has experienced very little or no irritation or swelling from the bites of this mosquito.

From 28 light trap collections made in this locality during the period from July to November, 1932, a total of 674 *A. walkeri* were identified, most of which were taken in August and the first part of September. This number may be compared with totals of 120 *A. quadrimaculatus* and about 10,000 *A. crucians* obtained in the same series of collections. Of 591 *A. walkeri* from collections that were recorded at hourly intervals throughout the night, 43 per cent were taken before

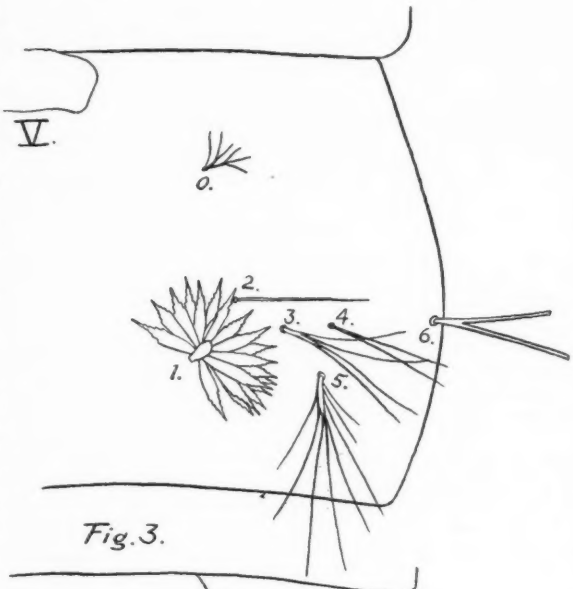

Fig. 3.

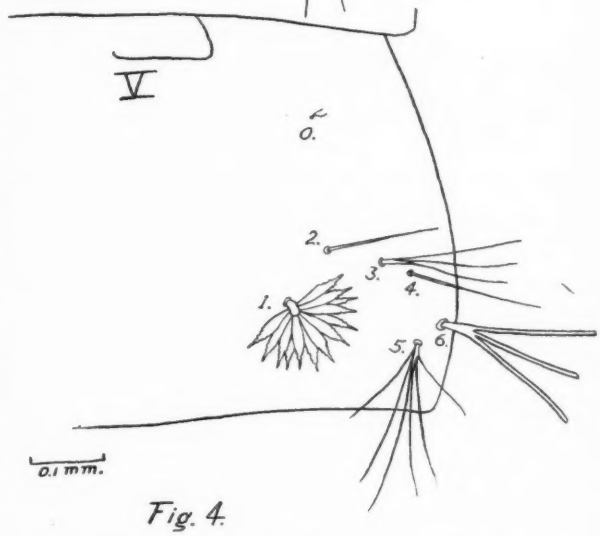

Fig. 4.

Fig. 3
Dorsal right half of fifth abdominal segment of *A. walkeri* (southern race), showing location and comparative sizes of hairs 0 to 6, inclusive.

Fig. 4
Same of *A. walkeri* (northern race).

11:00 p. m., 31 per cent from 11:00 p. m. to 2:00 a. m., and 26 per cent from 2:00 to 5:00 a. m.

Dyar[1] does not give characters for separating the larva of *A. walkeri* from that of *A. quadrimaculatus*. Matheson and Shannon[5] and Matheson[4] separate these two species on the basis of mandibular characters which are admittedly difficult to use. Specimens of both the northern and southern races of *A. walkeri* available to the writer indicate that these larvae may be separated readily from those of *A. quadrimaculatus* by the inner anterior clypeal hairs, which in *walkeri* are closely approximated at their bases and are sparsely feathered apically. In *quadrimaculatus* these hairs are separated at their bases by at least the width of one of the basal tubercles, and are not feathered. Hair No. 1 of the prothorax in *A. quadrimaculatus* is of approximately the same length as hair No. 3 and is either single or weakly branched apically, and hair No. 0 of the abdominal segments of this species is very small and inconspicuous, in both of these respects resembling the condition found in the northern race of *A. walkeri*.

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ON THE IDENTIFICATION OF THE MOSQUITO LARVAE OF THE GENUS ANOPHELES OCCURRING IN THE UNITED STATES (DIPTERA, CULICIDAE)*

By G. H. BRADLEY†
Orlando, Florida

Rather than to present a general discussion of the recent publications on the entomology of malaria, as has usually been the custom of the Chairman of this subcommittee, the Chairman this year has decided to confine himself to one phase of the subject, the taxonomy of anopheline larvae. It is the purpose of this report to present a key for the identification of the larvae of the genus *Anopheles* occurring in the United States based on characters which, in the opinion of the writer, are the most reliable for use in separating the various species.

*Report of the Chairman, Subcommittee on Entomology, read before National Malaria Committee (Conference on Malaria), meeting conjointly with Southern Medical Association, Twenty-Ninth Annual Meeting, St. Louis, Missouri, November 19-22, 1935.

†United States Department of Agriculture, Bureau of Entomology and Plant Quarantine.

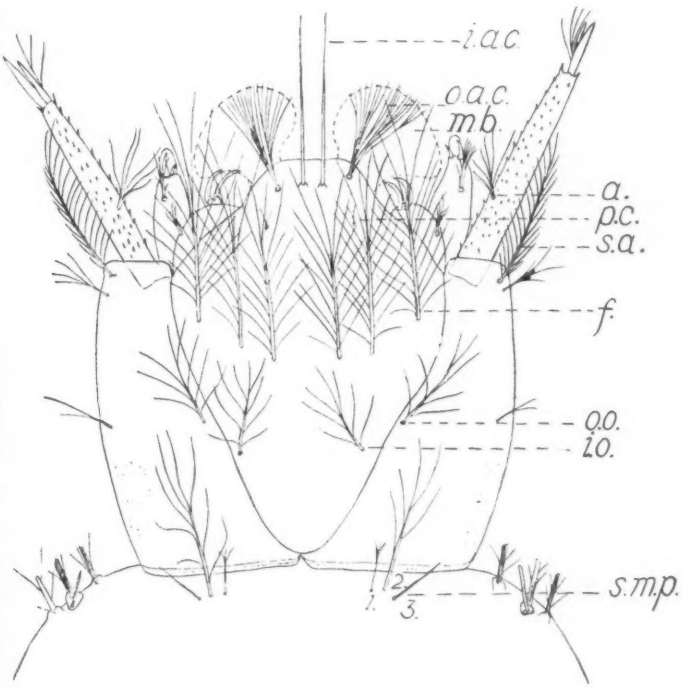

Fig. 1.

Dorsal view of head and prothorax of larva of *Anopheles quadrimaculatus*. *i.a.c.*, inner anterior clypeal hair; *o.a.c.*, outer anterior clypeal hair; *m.b.*, outline of mouth brush; *a.*, antennal hair; *s.a.*, subantennal hair; *f.*, frontal hair (3 pairs); *o.o.*, outer occipital (sutural) hair; *i.o.*, inner occipital (sutural) hair; *s.m.p.*, submedian prothoracic or anterior submedian thoracic group of hairs.

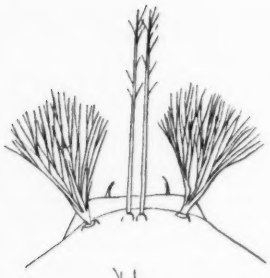

Fig. 2

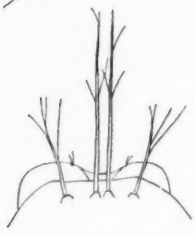

Fig. 3

Fig. 2
Clypeal hairs of larva of *Anopheles walkeri*.

Fig. 3
Clypeal hairs of larva of *Anopheles atropos*.

The publication in 1925 of Russell's[9] work on the identification of the larvae of southern anophelines made the separation of *A. quadrimaculatus, A. punctipennis* and the fresh-water race of *A. crucians* a comparatively simple task. Since that time Hegner, Root and Augustine[4] and Bradley[1] have published keys for identifying larvae of the salt-water race of *crucians*, and Hinman[5] has recorded characters by which the larva of *A. atropos* is easily recognized. Studies recently made have also shown characters by which the larva of *A. walkeri* may be separated. This species is reported to occur in the South in Virginia[2] and Louisiana[2,6] and has recently been collected by Mr. T. E. McNeel and the writer in Florida. The Florida specimens, however, apparently represent a southern race of the species, a note on which will be published shortly. The characters used for separating this larva from that of the northern form of *walkeri* were first pointed out by Dr. W. V. King, of this Committee. The writer is not familiar with the larva of *A. maculipennis*, and the characters used for separating its larva in the key are from Matheson[8] and Root.[4] Acknowledgment is also made of suggestions on the form of the key received from the work of Dyar,[2] Freeborn[3] and Matheson.[7]

In general, the larvae of all anopheline mosquitoes resemble each other rather closely, and it is only with the aid of a good microscope that their specific differences can be recognized. These differences lie chiefly in the form and size of the various hairs and setae that ornament the body of the larva. The figures given herewith will aid in locating the characters used in the following key. More detailed descriptions and illustrations of the various larvae will be found in the literature cited. While most of the characters used may be considered as fairly constant, individual variations in specimens often occur which cast doubt on the accuracy of the determination. In such cases, especially until more experience has been gained in the work, it is recommended that the specimens be reared and adults obtained for checking the larval determinations.

KEY TO THE LARVAE OF THE GENUS ANOPHELES OCCURRING IN THE UNITED STATES

(1) Abdomen with plumose lateral hairs on first 6 segments; head hairs simple.....*barberi*
Abdomen with plumose lateral hairs on first 3 segments only; head with plumose hairs..... 2

(2) Outer clypeal hairs simple, unbranched; elements of dorsal abdominal palmate hairs with long,

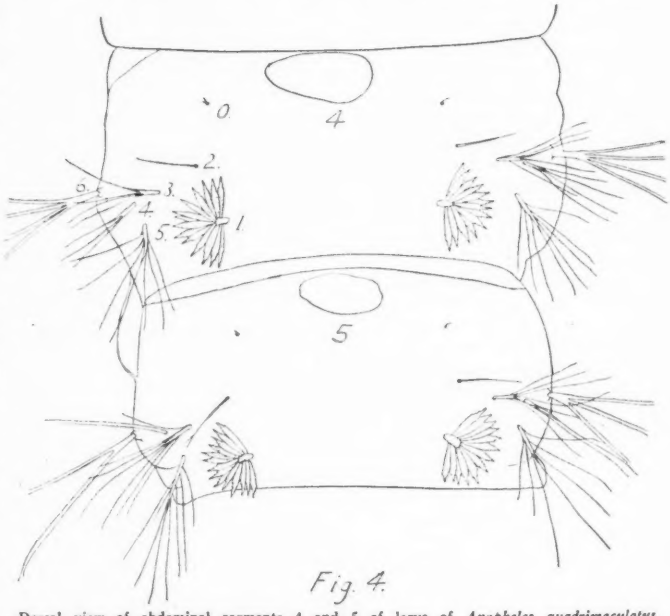

Fig. 4

Dorsal view of abdominal segments 4 and 5 of larva of *Anopheles quadrimaculatus*, showing location of hairs. 1, palmate hair; 2, antepalmate hair; 6, lateral hair.

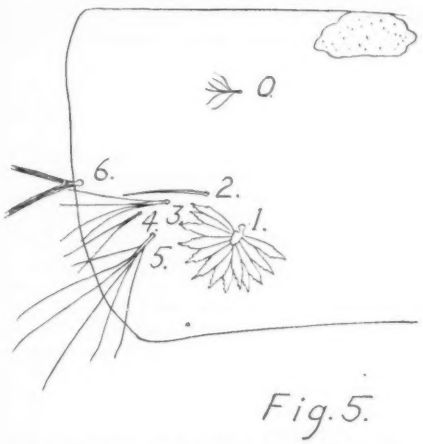

Fig. 5.

Dorsal view of left half of abdominal segment 4, larva of *Anopheles walkeri* (southern race), showing comparative size of hair 0.

slender apical portion.....*pseudopunctipennis*
Outer clypeal hairs branched, inner clypeal hairs simple, branched, or feathered; elements of dorsal palmate tuft notched toward tip..... 3

(3) Outer clypeal hairs with few (5 to 8) branches; inner clypeal hairs usually divided into 2 or more branches toward tip (*Fig. 3*); occipital hairs simple.....*atropos*
Outer clypeal hairs thickly branched, fanlike (*Figs. 1-2*) 4

(4) Abdominal segments 4 and 5 with 2 conspicuous hairs anterior to the palmate tuft. (These are of approximately equal size and each has from 4 to 9 branches.)....*crucians* (fresh-water race)
Abdominal segments 4 and 5 with but 1 conspicuous hair anterior to the palmate hairs. (This may be single or with 2 to 3 branches.) (*Fig. 4*) 5

(5) Abdomen with the palmate tufts on segments 3 to 7, inclusive, of similar form but those on segments 3 and 7 noticeably smaller than the others; posterior clypeal hairs long, usually single; antennal branched hair long, being approximately one-half the length of the segment from which it arises; tubercles of inner anterior clypeal hairs wide or close.....
.....*crucians* (brackish-water race)
Abdomen with the palmate tufts on segments 3 to 7, inclusive, of approximately equal size..... 6

(6) Tubercles of inner anterior clypeal hairs separated by at least the width of one of these tubercles; antepalmate hairs on segments 4 and 5 usually single, palmate tufts on segment 2 usually well developed.....*quadrimaculatus*
Tubercles of inner anterior clypeal hairs so close together that another tubercle of similar size could not be placed between them*..... 7

(7) Inner anterior clypeal hairs not minutely feathered toward tip; antepalmate hairs of abdominal segments 4 and 5 usually double or triple 8
Inner anterior clypeal hairs minutely feathered toward tip (*Fig. 3*); antepalmate hairs of abdominal segments 4 and 5 usually single..... 9

(8) Antepalmate hairs of abdominal segments 4 and 5 usually with 2 branches, rarely 1 or 3; posterior clypeal hairs usually with 2 branches from near base; inner anterior clypeal hairs single, unbranched .....*punctipennis*
Antepalmate hairs of abdominal segments 4 and 5 usually with 3 branches, rarely 2 or 4; posterior clypeal hairs usually long with apical branching; inner anterior clypeal hairs unbranched or with 2 to 3 branches beyond middle .....*maculipennis*

(9) Hairs 1 and 3 of submedian prothoracic group of approximately equal length; hair 0 (*Fig. 4*) on abdominal segments 2 to 6 poorly developed, usually single or having 1 to 3 branches.
.....*walkeri* (northern race)
Hair 1 of submedian prothoracic group approximately twice as long as hair 3; hair 0 on abdominal segments 2 to 6 fairly well developed and having 3 to 7 branches (*Fig. 5*)
.....*walkeri* (southern race)

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*These tubercles are described by Matheson[8] as not so closely approximated in *A. maculipennis* as in *A. punctipennis*. In certain cases this wider condition may cause confusion between the larva of *A. quadrimaculatus* and that of *A. maculipennis*. However, the secondary characters given for these two should separate them in practically all cases. Since preparing the key the writer has examined a series of *maculipennis* larvae and larval skins from Oregon, which were sent him through the kindness of Mr. H. H. Stage. In all of these the tubercles of the inner anterior clypeal hairs are closely approximated.

SOME PRELIMINARY OBSERVATIONS ON AIRPLANE DUSTING FOR ANOPHELES LARVAE CONTROL*

By ROBERT B. WATSON, B.S., M.D.†
Wilson Dam, Alabama

When the waters of the Tennessee River are impounded in October, 1936, by the closure of the General Joe Wheeler Dam, now under construction, a lake will be formed which will have a shoreline of approximately 950 miles. The nature of the terrain in the territory to be inundated is such that large areas of the lake will be quite shallow—many hundreds of acres having an average depth of less than three feet. In such areas it is anticipated that the water surface may be broken by vegetation consisting in part of sprouts from stumpage, and in part, after two to three years, of aquatic vegetation.

From our observations on *Anopheles quadrimaculatus* breeding in impounded waters we feel that in such areas we may expect very heavy mosquito production unless adequate control measures are instituted. Under these conditions the effectiveness of pool level fluctuation is problematical, and it is doubtful that such wide expanses of shallow water can be efficiently controlled by boat or hand anti-larval operations. These assumptions, together with the extremely long shoreline of Lake Wheeler, have turned our attention to airplane dusting as a possible means of control. During the summer of 1935 experiments were carried out to determine the effectiveness and cost of this type anti-larval operation with regard to shoreline and acreage control.

Thirty-three miles of the shoreline of Lake Wilson were set aside for airplane dusting; and for the acreage dusting experiment 120 acres of a small, spring-fed, natural lake and swamp, producing *A. quadrimaculatus* in great numbers, was used. The area selected for the shoreline dusting experiment, known as Shoal Creek, represents the impoundage of a tributary of the Tennessee River and comprises about 30 per cent of the routine mosquito control operations on Lake Wilson. Its shoreline is rather tortuous, much of it is flat, and numerous long, narrow bights occur (*Figs. 1* and *2*), many of which are in densely wooded areas. Since August, 1934, the pool level of Lake Wilson has been constantly maintained at maximum level, 10 inches above the normal elevation. This has resulted in the flooding of flat, shallow portions of the shoreline of Shoal Creek, which are normally not under water during the summer, abnormal production of aquatic vegetation, and heavy *A. quadrimaculatus* breeding. The shoreline requiring routine control operations varies from ten feet to about three hundred feet in width.

The dust used in the experiments was composed of Paris green and powdered soapstone, the Paris green component varying from 11 to 12.5 per cent by volume. It is well established that Paris green[1] is an efficient anopheline larvicide provided that it can be made available for larval ingestion. Other investigators[2 3 4 5 6 7] have demonstrated that Paris green dusts may be efficiently distributed over large areas by airplane, and their reports indicate that a uniform distribution of one pound of Paris green per acre usually results in anopheline larvae mortality of 90 to 100 per cent. Powdered soapstone was selected as the diluent because it is nearer the density of Paris green than any other similar material available to us at comparable cost. It was required that the Paris green used contain at least 50 per cent available arsenous oxide, that 95 per cent should pass a 300 mesh bolting cloth, and that it should kill anopheline larvae exposed to it in laboratory tests. Each lot was tested for arsenic content and potency. The dust was mixed in a large concrete mixer, and the proportion of Paris green to soapstone in the mixture checked by chemical analysis.

The airplane used is a biplane with a wingspread of forty-five feet (*Fig. 3*). It has a landing speed of fifty miles an hour and can climb one thousand feet in one minute. In front of the pilot's cockpit is a sheet metal hopper with a capacity of 850 pounds of dust. This hopper is loaded from above and the opening closed with an aluminum cowling flush with the fuselage. The dust leaves the hopper through a throat in the bottom and enters an aluminum venturi so constructed that the airstream from the propeller and the forward motion of the plane carries the dust cloud backward and downward. The size of the throat opening is regulated by a sliding panel operated by the pilot. The hopper (*Fig. 4*) contains two concave, slotted gratings, one above the other, with one-fourth inch clearance between them. The interval between the grating bars is about two inches. The upper grating is free and rocks back and forth through a one-inch arc, being propelled by an agitator shaft which is kept in motion by a small wind propeller on the lower right wing, through a twenty-to-one ratio gear box. When the plane is in motion the upper grating acts as a sifter and agitator and the two gratings result in a uniform flow of dust into the venturi. Our experience has been that without this arrangement the dust cloud is delivered in gusts of varying density.

To determine the effective width of the dust cloud delivered with this equipment, a number of trial flights were made. Glass slides were lightly coated with vaseline and were placed in shallow pans in a straight line in an open field at intervals of forty feet. The dust used was composed of one part of Paris green to eight parts of soapstone by volume. The plane was flown across the line of slides at right angles to it, at various elevations up to 150 feet, and at a speed of one hundred miles per hour. The slides were examined

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*Read before National Malaria Committee (Conference on Malaria), meeting conjointly with Southern Medical Association, Twenty-Ninth Annual Meeting, St. Louis, Missouri, November 19-22, 1935.

*Contribution No. 2 from the Health and Sanitation Sections of the Tennessee Valley Authority, under whose auspices were conducted the studies and observations on which this paper is based.

†Malariologist, Health Section, Tennessee Valley Authority.

microscopically to determine the concentration of Paris green per square inch. Arbitrarily taking twenty particles of Paris green per square inch as the minimum effective concentration, it was found that the effective dust path from a flight of fifty feet elevation was 520 feet wide and that the average concentration of Paris green in the path was 120 particles per square inch. We are aware of the fact that Williams and Cook, and King, found smaller concentrations of Paris green capable of producing an effective kill. These workers used slides without a vaseline film, and probably lost some dust particles, particularly the larger ones. We used the coated slides because we knew that some hours would elapse before the last slide could be picked up, and that the slides would receive rough treatment in the field. With a flight at 150 feet elevation the effective dust path was 560 feet wide with an average concentration of twenty-three particles of Paris green per square inch. With perfectly calm weather, with a flight at fifty feet elevation, the dust cloud was distributed 2.25 times farther to the right of the line of flight than to the left, in spite of the fact that the propeller blast is generally considered to be toward the left. In flights of 150 feet altitude or less it was found that winds up to five miles per hour shifted the dust cloud in the direction of the wind without materially altering the width or the distribution of the dust path, but that winds of greater velocity are likely to produce a very irregular distribution of Paris green.

Shoreline dusting flights were made at intervals of one week throughout the summer. Three hundred locations, covering every type of breeding situation on Shoal Creek, were selected. Two days before a dusting operation five dips were made in each location and the anopheline larvae catch recorded. On the next day a pan containing a vaseline coated slide was placed in each location, and on the next day dust was distributed by the airplane. The slides were collected as soon as possible after the flight and the concentration of Paris green per square inch determined. On the day following the flight five dips were made in each location to determine the effectiveness of the operation. As an additional check, fifteen adult mosquito catching stations were examined at weekly intervals to determine variations in *A. quadrimaculatus* density.

The pilot flew along the shoreline at an average height of sixty feet and at a speed of about one hundred miles per hour. He carefully watched the dust cloud and did not leave an area until he felt that it had

Fig. 1
Airplane photograph showing typical portion of Shoal Creek.

been reached by dust, and this sometimes required three flights over a single strip of shoreline. It was found that flights could best be made between 4:40 and 6:30 a. m., for at this time of day there was usually absolute calm. Later in the morning the air became "bumpy" and a wind arose, making flying conditions bad and the dust cloud difficult to place. The only major disadvantage of early flying is the presence of dew on the vegetation. However, our observations seem to show that some of the dust which is caught by the dew tends to fall to the water surface in the later morning when the dew has dried and the vegetation is disturbed by winds.

It should be emphasized that this type of flying is extremely dangerous. Frequent changes of direction at a low altitude are constantly made, and an error of judgment on the part of the pilot, or failure of the airplane to respond to its controls, would probably result in a fatal accident. The average time for dusting the thirty-three miles of shoreline was one and one-half hours, and the average amount of dust used was 1,500 pounds.

The cost of executing a shoreline dusting program with an airplane compares favorably with other types of anti-larval measures. We have found that the approximate cost per mile per week averages $5.19 for a single operation, or $103.80 per mile for a breeding season of twenty weeks. This includes dust materials, dust mixing and loading, depreciation and cost of operation of the airplane, and the salaries of the administration personnel. Our average cost for dusting this shoreline by boat and hand apparatus is $6.29 per mile, or $135.80 per season; and for oiling this shoreline with a kerosene-black oil-water emulsion is $6.51 per mile, per week, or $130.20 per season.

We have not succeeded in securing adequate control of shoreline anopheline breeding by airplane dusting as described above. The reduction in larvae for the entire area ranged from a minimum of 13.7 per cent to a maximum of 62 per cent. We never observed a satisfactory reduction in mosquito density which could be entirely ascribed to this operation. We believe that this failure may be attributed in whole or in part to our inability to secure a uniform distribution of the dust cloud on the water surface, due to the following factors:

(1) The size of the dust cloud was limited by the dimensions of the hopper throat. This difficulty was more apparent than real, for more Paris green may be applied to a given area by increasing the percentage

Fig. 2
Another view of Shoal Creek.

Fig. 3
Stearman bi-plane used for dusting experiments. Note the wi d propeller used in driving agitator in the dust hopper.

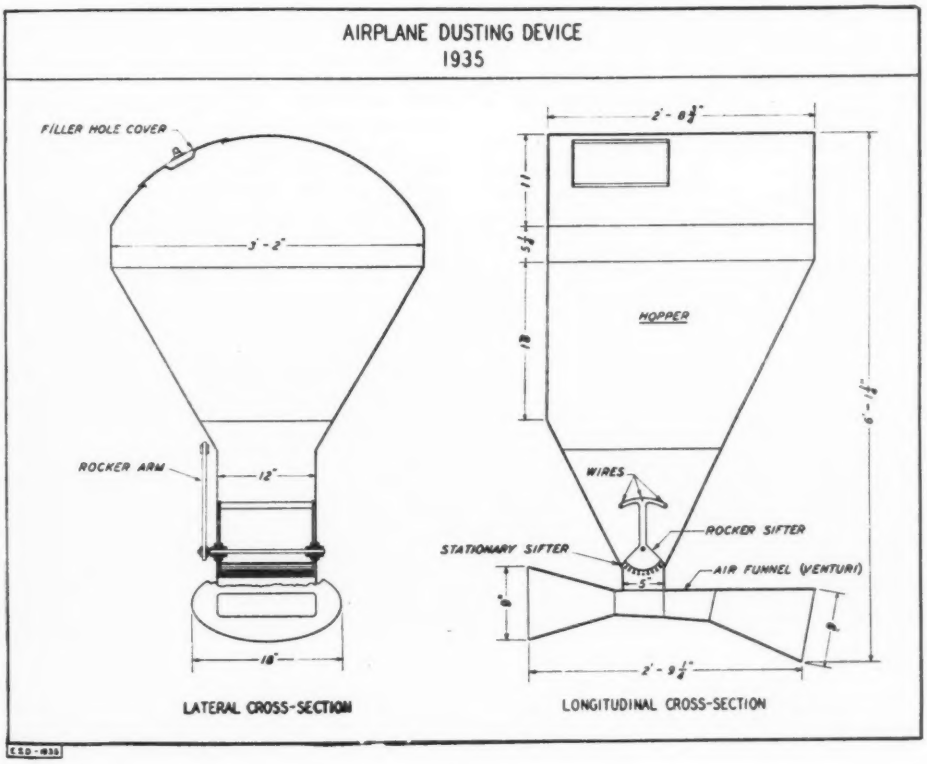

Fig. 4
Diagram of dust hopper showing agitator.

in the dust mixture, or by flying over a given area several times. However, we are re-designing the fuselage of our airplane to allow for a larger throat and venturi.

(2) It is almost impossible to supervise the distribution of the dust cloud. Our pilot gauges the efficiency of his dusting by the size of the dust cloud in relation to the width and type of area to be treated, the speed and direction of its travel, and the appearance of the film on open water. He can never judge accurately the adequacy of his dusting operations in dense vegetation, as can a hand-duster or boat-duster operator. When he is engaged in flying at high speed and low altitude along a curving shoreline or between trees his entire attention must be given to piloting the plane.

(3) Probably the most important factor is that of the predominant type of vegetation encountered on Shoal Creek. This consists largely of *Dianthera americana*, or "water willow weed" and a *Leersia sp.*, a sedge, one of the many plants of various sizes commonly called "saw grass." The former is a rank, leafy growth which emerges from the water to a height of one to three feet; the latter is a dense, low growth which produces many narrow, hairy leaves from a single large root clump. These two plants frequently occur together to form extensive beds which collect small flotage, and serve as excellent breeding places for *A. quadrimaculatus*.

Pan experiments carried out with larvae in the field seem to indicate that a density of 20 particles of Paris green per square inch is sufficient to produce practically 100 per cent mortality of third and fourth stage larvae in two hours. Yet, in such areas as described above, a few feet from a slide with a dust concentration of as much as 100 particles of Paris green per square inch, we have often found evidence of heavy breeding. We have concluded that in such areas the dust count is not a true index of distribution; that the horizontal foliage of *Dianthera* and *Leersia* intercepts a considerable amount of dust. This seems particularly true in the case of the latter plant: the leaves arch over the water and the hairs on the leaves seem to hold the particles of dust.

Since control dipping was done from 24 to 36 hours following dusting, the point may be raised that small larvae may have escaped death to develop into larger stages, thus altering the findings. During the past summer we found that under optimum conditions adult mosquitoes may emerge on the sixth day after hatching of the egg. With this in mind, an area identical to those described above was carefully dusted by hand with a 12.5 per cent Paris green dust, and three hours later many large larvae were found. Early in June a section of shoreline about one mile long was carefully cleared of vegetation. This place had been producing *A. quadrimaculatus* in very large numbers prior to cleaning, and continued to produce to a less extent after cleaning. In this place Paris green applied by airplane in concentrations as low as 8 particles per square inch constantly produced effective reduction of third and fourth stage larvae. However, adult catches indicated moderately heavy mosquito production from this breeding place throughout the period of weekly dusting flights. Had dust been applied at five-day intervals, results might have been better.

We believe that we are justified in concluding that the effectiveness of airplane dusting on Shoal Creek as

Fig. 5

Typical view of the Spring Creek area. The trees in the background are Tupelo gum. The water surface is almost entirely covered by *Potamogeton natans*.

judged by reduction of large larvae was directly proportional to the density of the prevailing type of aquatic vegetation.

The acreage dusting experiments gave very encouraging results from every standpoint. These experiments were conducted in the same way as those for shoreline dusting, except that larva density was computed in terms of larvae per square yard. Light cypress frames with inside measurement of exactly one square yard were built. These were lowered quietly to the water surface and after waiting for a few moments all larvae within the frame were removed and counted. The area was divided into five parts according to the prevailing type of vegetation, namely: (1) open lake with heavy, partially emergent vegetation such as *Potamogeton natans;* (2) sparse trees (Tupelo gum) with partially emergent vegetation (*Fig. 5*); (3) dense trees with sparse, partially emergent vegetation; (4) swamp with moderately dense, emergent vegetation; (5) swamp with very dense (200 plus per square yard) vegetation. The vegetation in the swamp areas consisted largely of *Saururus* and several species of *Cyperus.*

Flights were made at an average height of seventy-five feet and an average speed of one hundred miles per hour. The rate of dusting was approximately three acres per minute and the average distribution of Paris green was approximately one pound per acre. Flying conditions for dusting were bad throughout the series of experiments, with a minimum wind velocity of ten miles per hour and a maximum wind velocity of twenty miles per hour.

Under the worst conditions we obtained a 56 per cent reduction of larvae for the entire area, ranging from a 17 per cent reduction in the densely wooded area to a 79 per cent reduction in the densely vegetated swamp. Under poor conditions, with a wind of ten miles per hour, we obtained a maximum of 94 per cent reduction in the open lake region, 98 per cent reduction in the densely vegetated swamp land, and a 79 per cent reduction in the densely wooded area. During this experiment the average concentration of Paris green for the entire area was 83 particles per square inch.

Our average cost for this operation, using a 10 per cent Paris green by volume dust, was $1.22 per acre. The average cost for hand and boat dusting is $2.20 per acre, and for oiling $2.28 per acre.

We have given considerable thought to the fact that comparable dust distribution, as evidenced by slide examinations, resulted in wide differences in effectiveness in the two types of operation in spite of the fact that in some marshy areas on Spring Creek the vegetation was extremely dense. The answer seems to lie in the type of vegetation found in the Spring Creek marshes: it is more vertical than horizontal, and quite tall, and seems to offer relatively little impediment to the dust reaching the water surface. When it is desired to dust a water surface beneath trees, the foliage of which would tend to intercept dust, our pilot has found that by a careful adjustment of altitude and distance from the area to be dusted he can utilize a light breeze to good advantage to drift the dust cloud to the point desired.

In conclusion, it is our present opinion that a tortuous shoreline presenting vegetation such as that encountered on Shoal Creek does not offer a suitable condition for airplane dusting for *A. quadrimaculatus* control. Moreover, the operation is hazardous and might easily lead to a fatal accident. We feel that such areas can be better controlled by other methods. We intend to continue our experimental work with shoreline dusting and in certain selected cases will probably use this method as a routine control operation. While there is considerable waste of material in airplane dusting, this is more than offset by the fact that very large areas can be treated in a short time, and we believe that acreage dusting with an airplane will prove to be practical and reasonably safe. It is our present intention to use an airplane for this type operation in areas which require the application of Paris green dust as an anopheline control measure.

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OBSERVATION ON MOSQUITO CONTROL ON LAKE WILSON, TENNESSEE RIVER*

By C. C. KIKERT†
Wilson Dam, Alabama

Mosquito control on Lake Wilson has become of particular interest at this time owing to the more extensive impoundages proposed in the territory by the Tennessee Valley Authority. This project, undertaken by the War Department in 1918, was completed in 1925. The dam was constructed for the purpose of improving navigation and developing electric power.[1] At maximum elevation the lake has a shoreline of 130 miles and covers an area of about 14,000 acres. Approximately 40 per cent of the shore line is fairly steep,

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†Associate Sanitary Engineer, Tennessee Valley Authority.

subject to wave action, and has never offered a mosquito control problem. During flood periods the river carries considerable quantities of silt; however, with low flow normally occurring during the summer the lake water becomes quite clear. During these periods the water has a hydrogen ion concentration well beyond neutrality on the alkaline side.

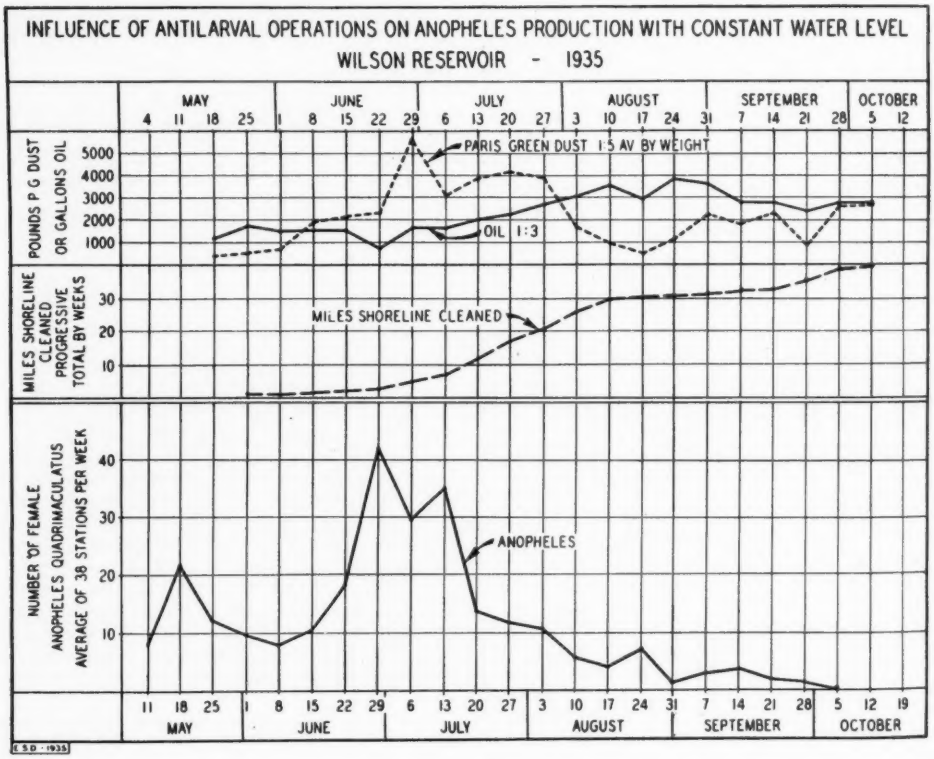
The history of this lake reveals a slow change of conditions influencing mosquito production, from the mats of drift and accumulations of flotage, presenting a problem during the first years of impoundage through an intermediary period of a relatively clear shoreline to the present time, when the spread of aquatic plants has increased the difficulty of control. None of the other lakes in Alabama offers a parallel to this project.

It would not seem amiss to review briefly the earlier history of mosquito control on the lake before recounting in more detail the work done during the past summer when special observations were made to determine the relative cost and effectiveness of several anti-larval measures.

Control Operations, Period 1924 *Through* 1934.—Initial impoundage was begun during the spring of 1924, though clearing had not been completed. The State Board of Health viewed this summer time impoundage with concern and the project was visited by representatives of the Board and the U. S. Public Health Service, who recommended anti-malaria measures. These were arranged with the War Department. The larvicidal operations, consisting of oiling through use of pneumatic spray boats developed earlier on another project in south Alabama,[2] were carried out during the period July 20-October 4, under direction of an assistant sanitary engineer from the State Board of Health.[3] Upon the initiation of control operations mosquito catching stations revealed a relatively high count of *A. quadrimaculatus,* but marked reductions were brought about as a result of anti-larval measures consisting of oiling and water level fluctuation.

During the summer of 1925 and 1926, anti-larval measures were applied by the War Department, using foremen and men trained during the season of 1924. There is little record of this work, though one report gives the cost of oiling and drift removal for the season of 1926 as $29,000.00, which amounts to about $223.00 per mile of shoreline.

During the season of 1927 the War Department employed an engineer to give technical direction to the



Graph 1

control work who had supervised such operations on another project the previous year under direction of the State Board of Health.[4] For convenience in reporting control operations bights and indentations along the shoreline were designated by use of numbers painted on small boards which were tacked to trees where they could be easily seen. During the year 10-inch flash boards were placed on the flood gates at the dam for the purpose of effecting a seasonal water level fluctuation in mosquito control.

The cost of oiling and drift removal for the season of 1927 was given as $34,000.00, which amounts to about $269.00 per mile of shoreline. Mosquito checking stations averaged three *A. quadrimaculatus*, though the water level was maintained almost constantly at maximum elevation.

Drift removal and routine oiling operations, through use of pneumatic pressure spraying equipment, were used with fair success during the seasons of 1928 and 1929.

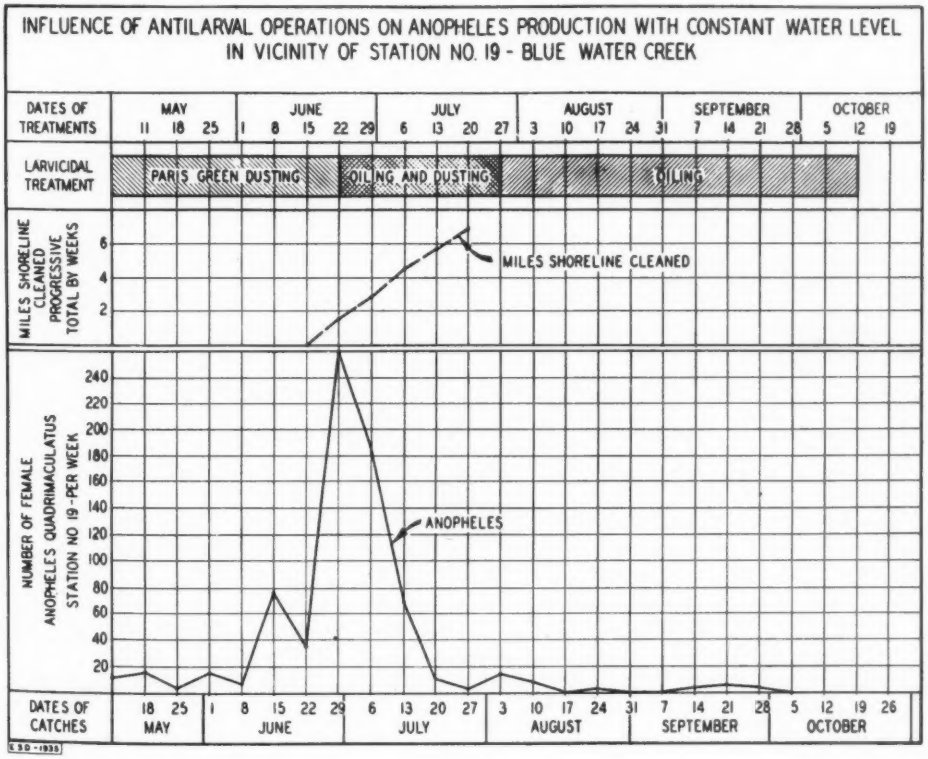
Control operations during the season of 1930 were the most successful. Mosquito counts for 14 stations averaged 1.9 *A. quadrimaculatus* for the season. A most favorable water level schedule was maintained.

It was during the season of 1931 that the effect of the spread of native aquatic plants, particularly *Dianthera americana* (water willow weed), began to be felt in the control operations. The water level schedule was not favorable to mosquito control and counts for fourteen stations averaged 8.6 *A. quadrimaculatus* for the season.

The officer in charge of Wilson Dam at that time made studies which resulted in the design and construction of the inboard motor powered "water oil" boats now being used on Lake Wilson.[5] The "water oil" method first used by the Alabama Power Company on Lake Martin consists of introducing the larvicide into the suction of a pump drawing water from the lake. The mixture of water and oil is discharged through a special nozzle. The advantage of this method lies in the force of the stream produced to carry through vegetation, break up flotage and reach areas 75 to 100 feet from the boat.

Fairly successful mosquito control resulted through a water level fluctuation of one foot at ten-day intervals during the season of 1932. Mosquito counts at 14 stations averaged 4.4 *A. quadrimaculatus*.

During the season of 1933 the lock for the proposed



Graph 2

Wheeler Dam at the headwaters of Lake Wilson was under construction. Water level fluctuation was limited on account of navigation requirements about the lock. Mosquito counts at 14 stations averaged 7.5 *A. quadrimaculatus* for the season.

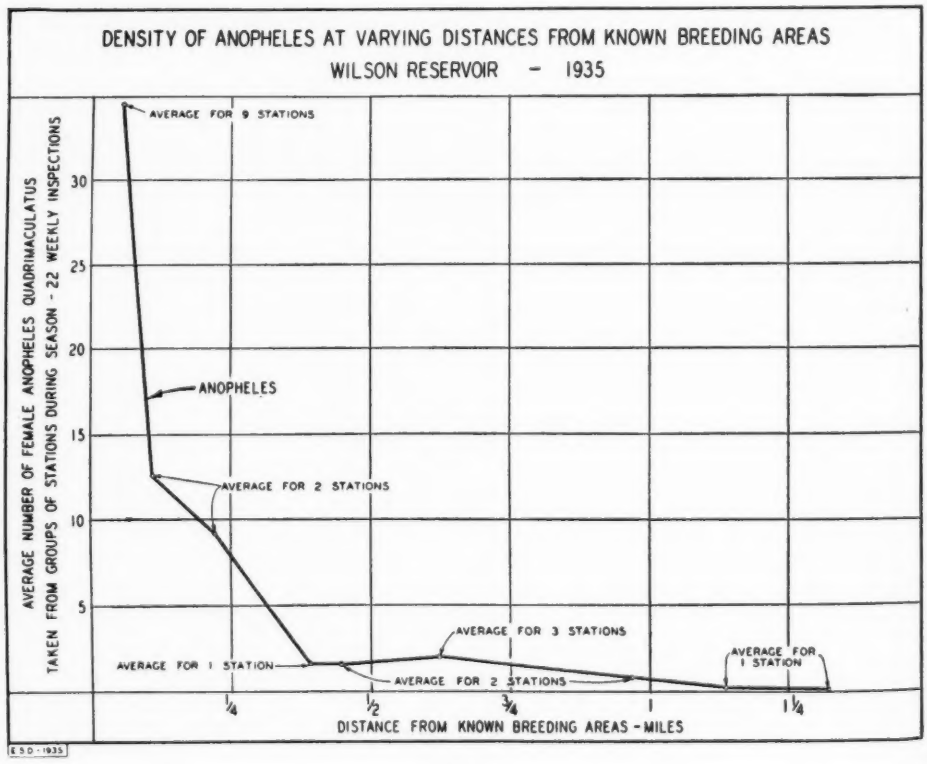
During the latter part of 1933 the Tennessee Valley Authority took over the operation of the Wilson Dam project. A Health and Sanitation Section was formed with sub-office at Wilson Dam. The 1934 mosquito season opened with the construction of Wheeler Dam well under way. Fluctuation was again limited on account of navigation requirements about the dam. The usual oiling operations were carried out in addition to some routine and experimental Paris green dusting. Counts at 26 mosquito checking stations averaged 5.8 *A. quadrimaculatus* for the season.

Control Operations, Season of 1935.—On May 1 a medical officer was placed in charge of the Health and Sanitation Section office at Wilson Dam. The staff listed a malariologist, an associate sanitary engineer, and later an aquatic plant biologist and an entomologist. An assistant sanitary engineer was placed in direct charge of anti-larval operations on the lake.

Upon the recommendation of the Authority's board of consultants on malaria control[6] the number of mosquito checking stations about the lake was increased from 26 to 38 and plans were completed to continue the airplane dusting experiment.

It was known prior to the beginning of the season that navigation requirements meant the maintenance of a constant water level on the lake. Plans were therefore made to handle the resulting unusually difficult problem of mosquito control through increased larvicidal operations and shoreline cleaning.

Larvicidal Operations.—During the first week in May it became evident that the beginning of *Anopheles quadrimaculatus* production was at hand, being thirty days earlier than observed during previous seasons. Larvicidal operations were begun at once and a temporary reduction in mosquito station counts was obtained. A sharp increase was experienced, however, between June 8 and 29. Thereafter a general decline followed the expansion of shoreline cleaning operations. The maintenance of low station counts during August and September is significant in that records of previous seasons show the peak of production usually



Graph 3

being reached during these months. Station counts averaged 10.7 female *A. quadrimaculatus* for the season. The results of the season's operations are given in Graph 1.

During the first part of the season a total of five combination "water oil" and dusting boats were used. Later, one of these boats was converted into a knapsack unit carrying six men for handling major areas where hand treatment was indicated. The larvicidal boats used on Lake Wilson are shown in photographs 1 and 2.

The estimated cost, not including overhead, of larvicidal operations on about 150 miles of shoreline for 22 rounds at weekly intervals amounted to $21,774.50, or $144.97 per mile of shoreline. This is based on labor at 45 cents per hour, oil at 6½ cents per gallon, Paris green at 24 cents per pound, lime at 0.8 cents per pound, soapstone at 0.7 cents per pound and airplane rental at $15.00 per hour. Comparative costs on the same basis for different methods of larvicidal treatment in selected areas, where they were required to be applied routinely, are given as follows:

(1) Oiling by boat and knapsack, per acre	$2.28
Per mile of shoreline	6.51
(2) Paris green dusting by boat and knapsack, per acre	2.20
Per mile of shoreline	6.29
(3) Paris green dusting by airplane, per acre	1.22
Per mile of shoreline	5.19

Shoreline Cleaning.—At the beginning of the season decision had not been reached as to how much shoreline cleaning would be required, or whether in carrying out such operations it would be more economical to use hand methods or attempt to improvise some mechanical equipment. Pending decision in this connection, a crew of fifteen men were put to work on cleaning by hand. The operations progressed satisfactorily and the force was shortly increased to thirty men. In the meantime, investigation indicated the uncertain utility of mechanical equipment. A member of the Authority's board of consultants on malaria control was called in and recommended an increase in the cleaning operations and more thorough application of larvicides. Accordingly, the force was increased to ninety men during the second week in July. This force continued through the week ending August 17, when all major breeding areas on the lake had been covered.

The chief growths removed on the cleaning operations were *Dianthera americana* (water willow weed), *Typha latifolia* (cattails), *Zizaniopsis miliacea*, *Leersia sp.* (saw grasses), and bordering the shoreline in shallow areas not ordinarily submerged were a multitude of grasses, various semi-aquatic plants, bushes, and willow trees and sprouts. The *Dianthera americana* was pulled up by the roots though a considerable number of the plants broke off and will sprout again. Cattails came up easily by the roots and should not sprout again in any quantity. The saw grass would not pull up by the roots and was required to be cut at the ground. The various grasses, semi-aquatic plants and bushes encountered at the shoreline were either pulled up or cut off at the ground. Willow trees were trimmed up and left standing. Drift occurring in the shallow bights and indentations along the open shoreline of the lake did not present a problem during the season of 1935.

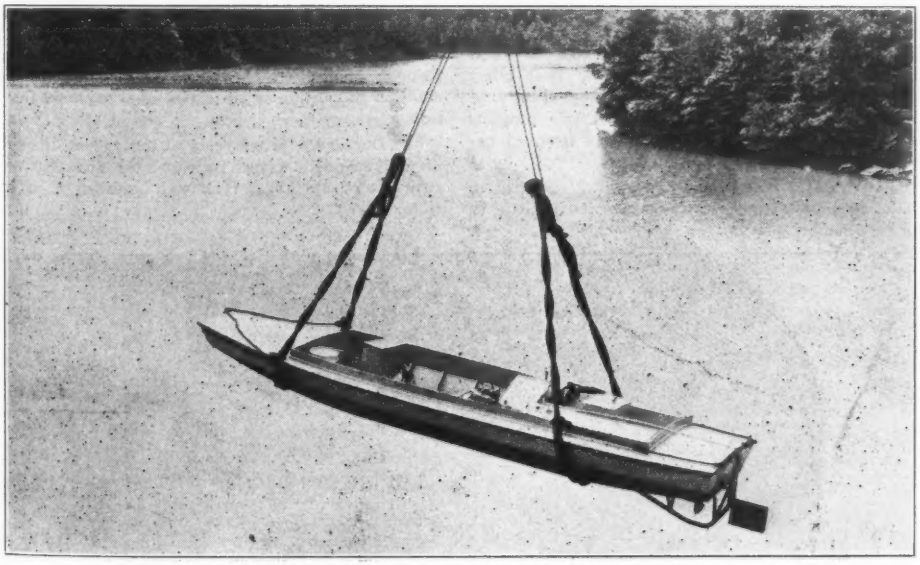


Fig. 1

The possibilities of poisoning in the control of aquatic plants is being investigated by the aquatic plant biologist with the health and sanitation section. Chemicals, particularly chlorates and arsenicals, give promise of successful application. Shading for the purpose of inhibiting marginal growth is also receiving attention.

The estimated costs, not including overhead, of the shoreline cleaning for 41.2 miles based on labor at 45 cents per hour, the principal item, was $12,207.47, or $296.30 per mile.

As to the season of 1936 we feel that construction of Wheeler Dam will be sufficiently advanced to permit water level fluctuation on Lake Wilson which will insure thoroughly effective control at greatly reduced cost.

Effectiveness of Anti-Larval Measures.—Observations as to the effectiveness of larvicides made during the early part of the season had a bearing on the anti-larval measures which were subsequently used. One of the first objectives was to determine the effectiveness of Paris green in a selected area. Accordingly, Paris green diluted with hydrated lime was thoroughly applied under close supervision to the Blue Water Creek area of Lake Wilson from May 11 to June 29. In the control test on Blue Water Creek, it is estimated that Paris green in excess of 2 pounds per acre of breeding area was applied. Referring to Graph 2, it will be noted that mosquito checking station No. 19, located in the center of this area, with no outside influence, revealed an increasing count of *Anopheles quadrimaculatus* mosquitoes, reaching a maximum of 280 on June 29. The effect of shoreline cleaning is clearly evident.

A somewhat similar observation was made as to Station No. 4 on McKearnan's Creek, though larvicidal operations were not so closely supervised. Both oiling and Paris green dusting were used in the vicinity of this station. The aquatic growth of major breeding areas in the vicinity of this station was removed between July 13 and 27.

The Paris green[7] used on the work was specified to contain at least 50 per cent arsenous oxide, to be ground sufficiently fine so that 95 per cent would pass a 300-mesh bolting cloth, and to kill Anopheles larvae. Each shipment received was checked by the chemical laboratory at Wilson Dam, and was found to contain the specific amount of arsenic. Fineness was not verified, as there was no equipment available for making the test. Toxicity was checked by noting that larvae were killed in the laboratory in pans within two hours.

During the season, comparative tests were made to determine the relative effectiveness of hydrated lime and soapstone as a diluent for Paris green. No appreciable difference was noted. Comparative tests were also made to determine the relative effectiveness of oil (3 parts kerosene and 1 part black oil) and Paris green. With thorough application of both larvicides, oil produced a greater Anopheles larvae mortality than Paris green.

Data on Flight Range of Anopheles Quadrimaculatus.—The entomologist with the health and sanitation section has prepared a graph bearing on the flight range of female *A. quadrimaculatus* mosquitoes. The average mosquito station counts on Lake Wilson for the season of 1935 have been plotted according to their distance from known producing areas. It will be noted from Graph 3 that the density of resting female *Anopheles quadrimaculatus* mosquitoes drops rapidly beyond ¼ to an almost negligible figure at ¾ miles.

SUMMARY AND CONCLUSIONS

(1) The initial impoundage of Lake Wilson occurring during the summer and fall of 1924 resulted in extensive production of *A. quadrimaculatus* which was limited by water level fluctuation and the application of oil as a larvicide.

(2) During the intermediary period a relatively clean shoreline prevailed when the degree of control secured through application of anti-larval measures was generally in proportion to the extent of water level fluctuation.

(3) During the latter years of the project the spread of native aquatic plants increased the difficulty of securing adequate control through application of larvicides.

Fig. 2

(4) During the season of 1935, oil proved to be a more effective larvicide than Paris green on Lake Wilson, though slightly more expensive.

(5) Under the conditions resulting from the maintenance of a constant water level at maximum elevation during the season of 1935, shoreline cleaning or removal of aquatic and semi-aquatic growth in major breeding areas was essential to *A. quadrimaculatus* mosquito control.

(6) While hand removal of growth along the shoreline of the lake may not have lasting value, it was considered necessary during the season of 1935. If this or similar operations, aimed at permanent shoreline improvement, are carried out during subsequent seasons the effectiveness of other anti-larval measures should be increased and the spread of aquatic plants limited to some extent. Such a program should also tend to reduce the overall annual cost of anti-larval measures.

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7. Product of Sherwin-Williams Company.

DISCUSSION (*Abstract*)

Mr. Nelson H. Rector, Jackson, Miss.—It is interesting to learn that conditions on the lake have undergone the changes indicated by Mr. Kiker and that the principal cause for concern at this time is the spread of aquatic vegetation.

In the spring of 1924 the United States War Department began filling in sections of the dam and thus started impounding Lake Wilson.

Early in the spring of 1924 it was brought to the attention of Dr. S. W. Welsh, State Health Officer, that malaria was fast becoming a serious problem in the territory adjacent to Lake Wilson and subsequent reports from county health departments indicated that it was assuming epidemic proportions in certain areas.

The State Board of Health called in Dr. T. H. D. Griffitts and Mr. J. A. LePrince to consult with their engineers. These consultants recommended that anti-larval work be undertaken immediately, and that the water level be raised and lowered at periodic intervals.

Dr. Welsh finally succeeded in showing the War Department the necessity for immediate action, and they agreed to furnish 5 paddle boats, 2 motor boats, 1 foreman and the necessary oil and labor. Actual work was started in July.

The water had been rising for some time and was coming up through the boughs of the standing timber, some of which was dead. The shoreline, particulary in the bights and indentations, was lined with drift and flotage, and in many sections the water was so shallow that oiling had to be carried on by hand.

Suitable catching stations were established at strategic points and weekly catches of adult Anophelines were made. The information from these catching stations was invaluable to me in directing work on the lake, as it made it possible for me to utilize the limited equipment available to the best advantage.

At the end of three weeks, a reduction in the number of adult *Anopheles quadrimaculatus* was noted. A further reduction was experienced following the lowering of the water level late in August.

Mr. Kiker's table showing the density of adult Anopheles at different distances from the lake is also very interesting, and I am wondering if he has made any tests to determine the maximum flight of *Anopheles quadrimaculatus*.

In Italy, larvicidal operations were first undertaken in a zone extending approximately 1 kilometer from the thickly settled areas. However, our experience showed that our anti-mosquito work must in many instances be extended to cover 3 kilometers.

We also found in Italy, in one region, that the *Anopheles maculipennis* (one that breeds in running streams) was the main vector of malaria.

Experience has taught those in charge of malaria control operations, be they in urban or rural sections, or on impounded areas, that they should at all times study each situation carefully and then utilize every known method of control that gives promise of success. The time is past when cut and dried rules could be successfully employed.

INDUSTRIAL RELATIONS IN MALARIA*

By C. P. Coogle, M.D., *Chairman*,**
Houston, Texas

Craig Barrow, M.D.†
Savannah, Georgia

W. G. Stromquist‡
Knoxville, Tennessee

Darrell Clark§
Bodin, North Carolina

The annual report of your Sub-Committee on Industrial Relations for the year ending with October, 1935, is herewith submitted.

Efforts have been made to secure information from several key industries of the South relative to malaria control and anti-mosquito measures. It is hoped that this information may be of interest and value to the National Malaria Committee, and also may be an index to the trend of activities which are perhaps being conducted by many industrial companies in the South.

We have chosen to try to make this report representative of the lumber industry of the South, the ten leading railroads of the South, certain water and electric

*Annual Report for 1935 of Sub-Committee on Industrial Relations, read before National Malaria Committee (Conference on Malaria), meeting conjointly with Southern Medical Association, Twenty-Ninth Annual Meeting, St. Louis, Missouri, November 19-22, 1935.

**Malariologist, U. S. Public Health Service.
†Chief Surgeon, Central of Georgia Railroad.
‡Engineer, Tennessee Valley Authority.
§Engineer, Property Superintendent, Tallassee Power Company.

power developments in the South, and something to represent the industrial insurance corporations of the South. Our means of obtaining these data have been primarily by letters of inquiry, asking the respective executive officers to give us certain information and opinions; secondly, by the use of a specially prepared questionnaire to departmental officers who were personally known to some member of this sub-committee.

In order to conserve time and space in this report, we shall abstract the data of each industry and summarize them.

(1) *The Lumber Industry of the South.*—This information is from nine major lumber companies of the South. These companies report an employment during 1935 estimated to be approximately 71.4 per cent of normal capacity, and 93.8 per cent of all employes in these companies during 1935 were classed as skilled labor. Of the nine companies answering our questions, only three report having conducted any malaria control activities or anti-mosquito work during the year 1935. All nine companies had, however, engaged in some form of malaria control from time to time during the last ten years. All nine companies list malaria as a liability to the lumber industry of the South; all nine companies report malaria as probably on the increase among their employes during the past two or three years. Six of the nine companies report having discontinued malaria control work because of lack of money, due to the economic depression.

These nine companies own fourteen sawmill villages, totaling 3,873 tenant houses, situated in five Southern states.

Six of these company villages have company physicians living in the villages. For the remaining eight villages, company physicians' visits are made on call or by office hours. Four of the nine companies operate company hospitals for their sick and for surgery.

MALARIA IN LUMBER INDUSTRY, 1935

Per cent of hospital admissions diagnosed malaria	7.6
Per cent of physicians' calls for malaria	16.4
Per cent of dispensary drugs for malaria	19.7
Average days in hospital per case of malaria	5
Average days off duty per case of malaria	9

The cost of malaria control and anti-mosquito activities reported by three companies was approximately as follows:

Cost of screening and repairing screens on company's tenant houses	$2,450.00
General clean-ups of sawmill villages, no cost to companies	
Ditching and oiling on company property during summer months	450.00
Dispensing quinine to those not sick at the time	50.00

Ten Railroads of the South.—All ten railroads report having engaged in malaria control activities during the last ten years; however, only four railroads report having engaged in malaria control measures during 1935.

The years 1929 and 1930 seemed to have been the peak years of malaria control work by these railroads. Tabulations from a very complete questionnaire sent to each chief surgeon of these ten railroads by Dr. Craig Barrow, Chief Surgeon of the Central of Georgia Railroad and a member of the Sub-Committee, reveal the following data:

All railroads reporting list malaria as an economic problem.

All railroads reporting list malaria as a costly liability.

Railroads operating company hospitals list admission from malaria as ranging from 0.1 to 8 per cent of all their medical and surgical cases.

No deaths from malaria were reported among railroad employes during 1935. Average days in hospital per malaria case were 5½, and average days off duty per malaria case, 14. All railroads expressed a willingness to collaborate with state and Federal officials in malaria control work.

Three railroads gave approximately 75,000 gallons of oil to 41 towns along their roads during 1935 for use in anti-mosquito work. Four railroads gave quinine to employes who asked for it.

Screening and maintenance of screens on section houses and movable boarding cars have been kept up to almost the peak years of malaria control activities. Four railroads have full-time men engaged in malaria control activities in 1935. Two railroads are spending more than $5,000 per year for malaria control work; the remaining eight railroads spent less than $5,000 each during 1935 for malaria control work. Seven railroads report malaria to be a serious economic problem in the industrial and agricultural areas which they serve.

Water Power and Electric Companies.—Four impounded water power and electric companies kindly consented to give the Committee information relative to their activities in malaria control and mosquito destruction work during 1935.

No company wished to reveal the amount of money spent on malaria control measures during 1935 for reasons better known to themselves (perhaps related to company administrative affairs). Each of the four companies did conduct mosquito control work and malaria control measures to some extent. They list: Paris green, 28 gravity oil and chemical larvicides as materials used to destroy mosquito larvae. Regarding malaria control expenditures, two companies report:

"Our company has spent thousands of dollars during the last few years on malaria control work; this year we are limiting our anti-malaria work to what help we can give our employes, repairing screening, furnishing quinine and mosquito repellants."

"We are spending hundreds of dollars this year placing "atabrine" in the hands of physicians for the purpose of treatments of employes and residents around the impounded waters of the company."

Each of these companies lists malaria as a liability. Each had full-time mosquito fighting crews during 1935. Each has anti-mosquito work and malaria control measures conducted through its medical department.

Three of these companies hospitalize their medical and surgical cases. Admissions to company hospitals diagnosed as malaria range from 3.5 to approximately 25 per cent of all cases. Average days in hospital dur-

ing 1935 per malaria case were 3; average days off duty during 1935 per malaria case were 11. Each case of malaria actually costs the companies more than $40.00.

Industrial Insurance Companies.—Two insurance companies gave us the following data:

Malaria is listed as a liability to insurance debits.

Malaria (the disease) is listed nineteenth and twenty-third, respectively, on their lists of diseases causing disability claims.

The average disability claim from malaria is twelve days.

(In each of these companies seven days of illness must elapse before a claim can be made for disability from illness.)

The average cost in disability per malaria case is $27.50.

Insurance nurses report malaria as the most unsatisfactory problem they have to contend with in their home visits and care of the company's beneficiaries.

SUMMARY

From these data we conclude that malaria control work declined during 1935 among the industrial companies in the South. All companies are in accord and agreed that malaria is a liability to industry. These data show that the same malaria control activities and anti-mosquito measures are used by all companies engaging in malaria control work. The economic depression seems to be the only excuse given for the decline in malaria control work by the companies.

The medical authorities engaged in industrial practice for these companies contacted are also agreed and are of the opinion that malaria is the cause of economic loss to employe and employer alike.

MALARIA CONTROL PROGRAM OF THE TENNESSEE VALLEY AUTHORITY

The malaria problem of the Tennessee Valley Authority is related to impounded reservoirs created by dams built in the general improvement of the Tennessee River for flood control, navigation, and incidental power development.

The Wilson Reservoir has a shore line of 130 miles. The dams now under construction will create reservoirs with shore lines as follows: Norris 705 miles, Wheeler 950 miles, Pickwick Landing 550 miles, making a total now definitely in prospect of 2,335 miles, of which 1,630 miles will be in an area where malaria is endemic. Norris Reservoir will lie in an area of rugged topography in Tennessee; the Wilson and Wheeler Reservoirs are entirely in Alabama, and the Pickwick Landing Dam is situated in Tennessee, but the reservoir will also affect parts of Mississippi and Alabama. The latter three dams will make a continuous series of pools for a stretch of the river 155 miles long.

A definite policy of seasonal and periodic fluctuation of water level in reservoirs for malaria control has been adopted by the Authority. The Project Planning Division has made studies with a view of synchronized operation of possible power plants by transferring load from one plant to another to provide the desired fluctuation and is also including fluctuation for malaria control in studies of the operation of reservoirs for the best results for flood protection and navigation.

The Authority has also recognized the importance of proper preparation of the basins for impoundage and is clearing the basins in accordance with the regulations of the state health departments. The State Health Department of Alabama has modified the regulations as applied to the marginal clearing and these regulations have effected a considerable saving and will also provide more favorable shore line for future malaria control operations.

In the fall of 1934 malaria surveys were made of the Wilson and Wheeler areas. In the Wheeler survey blood smears were taken of every fifth family as a sample population. In the rural population of approximately 25,000 the sample population showed a percentage of positive blood smears varying from 10 per cent in Lauderdale to 60 per cent in Lawrence County, with an average of 27 per cent. In Decatur and Guntersville, with about 13,000 and 1,000 persons respectively affected, the percentage of positive smears in the sample population was 9 in Decatur and 7 in Guntersville.

In the fall of 1935 a similar survey was made in the Pickwick Landing and Wilson reservoir areas. In addition, school surveys, including blood and spleen indices, have been made in the three areas. The houses within one mile of the future shore lines have been numbered in the field as well as on maps so that definite records can be made of the location of the homes of the pupils included in the school surveys.

Realizing the seriousness of the problem of these extensive areas favorable to the production of Anopheles in an area where malaria is now prevalent, efforts are being made to develop more effective and economic methods of control. This has included experiments on Paris green dusting from air planes and the control of aquatic vegetation.

In order to insure development of the malaria control program in the light of authoritative opinion, a malaria consultation board has been established consisting of Dr. L. L. Williams, Dr. T. H. D. Griffitts and Mr. J. A. LePrince, of the U. S. Public Health Service; Dr. Mark F. Boyd, of the Rockefeller Foundation; and Dr. W. V. King, U. S. Bureau of Entomology. The value of their advice and assistance cannot be overestimated. It has been the purpose to develop the health and sanitation section of the Authority in such a manner as to supplement and extend existing facilities rather than to duplicate any facility, and cooperation with Federal agencies and with state and county health departments is being maintained to the fullest possible degree.

In the development of a malaria control program the health and sanitation section has had the active support of the board of directors of the Authority and the full cooperation of all sections concerned with the design and construction or operation of any features influencing malaria.

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M. Y. DABNEY, M.D., Editor
EUGENIA B. DABNEY, M.S., Associate Editor
C. P. LORANZ, Secretary, Treasurer and General Manager

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EDITORIAL DEPARTMENT

SOUTHERN MEDICAL ASSOCIATION
Thirtieth Annual Meeting
Baltimore, Maryland, November 17-20, 1936

THE BALTIMORE MEETING

August 1 finds plans well rounded for the Southern Medical annual meeting which is to be held in Baltimore in about three months. The President of the Southern Medical Association, Dr. Fred M. Hodges, of Richmond, the General Chairman of the meeting, Dr. Sidney R. Miller, of Baltimore, the President of the Baltimore City Medical Society, Dr. Charles C. W. Judd, and the essential interlocking committees there have their work well under way. The section officers of the Association, capable men in the various Southern states who are responsible for the scientific programs, are preparing an inclusive review of medical progress. All groups are cooperating to make the meeting both a recreation and, as the President of the United States says, a "re-creation" for physicians of this part of the American continent.

All gatherings will be held in one large building, the Fifth Regiment Armory, which is ample for the purpose.

The time schedule will be roughly that of last year. On Tuesday, November 17, clinical sessions will be conducted by Baltimore physicians. A public meeting will be held on Tuesday evening in which men of national reputation will discuss topics of public health interest. On Wednesday morning two general sessions will convene, a surgical and a medical session, to be addressed by well-known physicians from various localities. Most of the section meetings will begin on Wednesday afternoon, November 18, to continue through Friday morning. On Friday afternoon clinics and ward walks will be conducted in leading hospitals of the city.

Baltimore is one of the half dozen great medical centers of the world. It has everything to offer the physician in the way of new investigative work and evaluation of medical progress. For itself alone it is well worth an annual pilgrimage. Bringing into its limits this year one of the largest medical associations of the country, it should offer irresistible attractions to American scientists.

A bulletin outlining the plan of the meeting has been mailed to twenty-six thousand physicians in the South, a large proportion of whom are expected to attend. Those who have not made hotel reservations should do so at an early date.

CAUSE OF DIABETES MELLITUS

There are many reasons to convince one that diabetes is a disease of the pancreas. It occurs experimentally when the pancreas is removed, and thus would seem to be a hypopancreatism. Insulin of course is obtained from the pancreas. Certain pancreatic tumors secrete insulin and are accompanied by very low blood sugars or periods of apparent insulin shock. These cases might be referred to as due to hyperpancreatism. Yet no one has demonstrated a characteristic pancreas of diabetes, and in a considerable proportion of cases of diabetes the islet or secreting cells of this organ appear perfectly normal.

After the pancreas of the dog has been removed and he has developed glycosuria, removal of the anterior pituitary will restore the blood sugar to normal and relieve the symptoms of diabetes. Two wrongs thus in a way make a right. Injections of anterior pituitary extract will cause a recurrence of diabetic symptoms in the dogs which have neither pancreas nor pituitary.

In acromegaly (hyperpituitarism) there is glycosuria. Theelin, the ovarian hormone, is believed to have some inhibitory influence upon

the anterior pituitary. Its use has therefore been suggested in diabetes.

Gibson and Fowler,[1] of the University of Chicago, have observed a group of cases in which dwarfism and infantilism were associated with severe diabetes. Thus apparently under-function of the anterior pituitary rather than over function characterized these cases of diabetes. Some of the patients were given theelin, which not only failed to improve the diabetic symptoms, but actually caused a temporary decrease in carbohydrate tolerance. There is evidently a close association of both pituitary and pancreatic function with sugar metabolism and it has not been shown which gland initiates the train of pathologic symptoms.

The close relationship of pituitary and pancreas in sugar assimilation has been demonstrated in another way, beginning at another link in the reacting chain to show the effect of excess sugar upon these organs. Jacobi and Colwell,[2] of the University of Chicago, have developed a technic of prolonged continuous intravenous administration of glucose to normal dogs. It eventually causes the death of the experimental animals. Glucose is of course used freely in surgery and medically in conditions of dehydration. It is usually considered harmless, but in the quantities given by Jacobi and Colwell it was fatal in a comparatively short time. The alkali reserve was totally depleted and acidosis developed. Autopsy showed congestion of all the viscera with intense hemorrhage specifically in the pancreas and anterior hypophysis, and destruction of both these glands.

Thus, not only are pancreas and pituitary capable of disturbing carbohydrate metabolism, but abnormal carbohydrate in the blood can injure these particular tissues.

From this work, diabetes may as well be a disease of the pancreas and anterior pituitary glands initiated by excess sugar in the blood as a disease of sugar metabolism initiated by dysfunction of a gland. In the former case, it is easy to believe that the inciting cause is an excess of carbohydrate in the daily diet. Improper eating, then, could precede the onset of hyperglycemia and glycosuria and result in injury to the pancreas and anterior hypophysis. Insulin reduces blood sugar. Anterior pituitary extract increases it. Continued high blood sugar induces injury of both these organs, perhaps initiating a vicious circle since proper function of both would appear to be essential to normal carbohydrate metabolism.

1. Gibson, R. B.; and Fowler, W. M.: Infantilism and Diabetes Mellitus: A Report of Eight Cases. Arch. Int. Med., **57**: 695 (April) 1936.

2. Jacobi, H. R.; and Colwell, A. R.: Lesions in Pancreas and in Anterior Hypophysis with Fatal Acidosis Following Prolonged Intravenous Administration of Glucose in Dogs. Amer. Jour. Physiol., **116**:194 (June) 1936.

GLEANINGS FROM RECENT JOURNALS

Metallurgy of the Lane Plate.—The effect of metals used to hold bone fragments together has been studied from many angles. Rustless steels are of many compositions and varied reaction in body fluids. A vanadium steel alloy, according to Jones and Lieberman,[1] was investigated by the American College of Surgeons and the United States Bureau of Standards and recommended for use in the Lane plate. If rustless steel tacks of various compositions, according to the above authors, are inserted in the bone of the living dog and removed and weighed after thirty days, a very varying amount of absorption of metal is noted. All the vanadium steel tacks were very loose in the bone. The hole and soft parts were black, showing considerable corrosion and absorption of metal. The alloy prescribed for the standard Lane plate caused extensive necrosis of bone and interfered with bone synthesis. Of various alloys tried, a chromium rustless steel of specified composition was preferred.

Theelin Dosage.—In clinical experimentation with the ovarian hormone theelin, the tendency seems to be to use larger and larger doses. Commercial preparations which formerly contained 50 to 100 units per c. c. now may contain 1,000 or 10,000 on the theory that enormous quantities of the hormone are needed for human beings. Dempsey, Hertz and Young[2] have shown that the normal female guinea-pig's response to theelin varies at different periods in her cycle, that the spayed animal is more responsive than the normal, that 1,000 units of theelin induce rutting in less than a third of injected female guinea-pigs. However, if 40 units of theelin were given followed in one or two days by 0.2 to 1 unit of progesterone (corpus luteum hormone) all the injected animals gave the characteristic response in about five hours. Forty units of theelin plus a small amount of progesterone were more effective than twenty-five times the quantity of theelin alone. Theelin is

1. Jones, Lawrence; and Lieberman, B. F., Jr.: Interaction of Bone and Various Metals, Vanadium Steel and Rustless Steels. Arch. Surg., **32**:990 (June) 1936.

2. Dempsey, E. W.; Hertz, Roy; and Young, W. C.: Amer. Jour. Physiol., **116**:201 (June) 1936.

generally considered the hormone solely responsible for the induction of heat.

Species differences in response to ovarian and pituitary hormones are very great and unpredictable. Confusion has been thrown upon the subject of human menstruation by attempts to compare it with animal heat. Corpus luteum hormone is probably as important as theelin in the normal human cycle. Its place in clinical medicine may be investigated since it is now among the hormones available for clinical study. From the above physiological work, reinforcement of small doses of theelin with a small quantity of progesterone may bring about results not obtainable simply by multiplying the dosage of the first ovarian hormone.

Adrenal Hypertrophy and Vitamin C.—The effects of dietary deficiency on endocrine structure will probably provide a fruitful subject for pathologic study. Vitamin C deficiency in the guinea-pig results in adrenal hypertrophy,[1] apparently an effort of these glands to compensate for the dietary deficiency. Similarly the thyroid hypertrophies in the face of iodine shortage and the parathyroids during rickets. The adrenalectomized dog, if given cortical extract, can live without vitamin C. The adrenalectomized guinea-pig cannot.[2] The human being is apparently very susceptible to C deficiency, possibly also to the compensating enlargement of the adrenals.

The adrenals would appear to respond to dietary deficiency like the thyroid and parathyroid. The thyroid for many years, the parathyroids more recently, have been important organs for surgical attack. Possibly an increase in frequency of adrenal surgery is next to be expected.

1. Quick, A. J.: Hypertrophy of the Adrenals in Scurvy. Proc. Soc. Exper. Biol. & Med., **30**:753, 1933.

2. Sirrbely, J. T.; and Kendall, E. C.: Vitamin C and the Adrenal Cortical Hormone. Amer. Jour. Physiol., **116**:187 (June 1) 1936.

3. Schlotterbeck, J. O.: Jour. Mich. State Med. Soc., quoted in Sou. Med. Jour., **4**:309, 1911.

TWENTY-FIVE YEARS AGO

FROM JOURNALS OF 1911

Multiplication of Names for Identical Preparations.[1]—"Suppose some genius conceived the plan of placing on the market common cane sugar under the name of 'sugarine', and advertised it in most glowing terms as the most wonderful sweetener the world ever knew at a price of $1.10 a pound. Another, quickly recognizing the credulity of the public, exploits cane sugar as 'sweetol' and makes additional arguments why it should be used in preference to others, and sold at 75 cents per pound. Another places 'Dulcitol', at 50 cents per pound, and finally an honest dealer offers the same article at 5 cents per pound as saccharum, or sugar. What would you think of the cook who would use several of these brands of sugar in making your pastry? An exactly similar condition exists in medicine today. The pharmacopeial synthetic hexamethylenamin is on the market today under the name urotropin, cystogen, aminoformin, formin, uritone, urisol, cystamin and so on at prices ranging from 10 cents to $1.10 per ounce. It is not uncommon for physicians to prescribe one or more of these fancy-named, but identical synthetics in the same mixture, expecting to get the combined action of different urinary antiseptics. It is also true that patients have been treated first with hexamethylenamin under one name and then the same article under another name, in the expectation that looked-for results will finally manifest themselves."

Advertising by Physicians.—"Dr. W. H. Sanders, State Health Officer of Alabama, recently placed before the Legislature a bill one section of which made it unlawful for a physician to advertise himself or his practice "whether through newspapers or other periodicals, or by circulars, or otherwise, in such a manner as tends to deceive the people in matters pertaining to health." * * * The bill did not propose to keep doctors from advertising themselves and their business whenever and wherever they saw fit, so long as they so worded their buncombe that it would not tend to deceive the public in matters pertaining to health. * * * Of course the Journal is sorry for the publishers who will lose the profits now reaped from broadside quack advertisements but they will not really lose in the end. The journal knows. Within twelve months it has declined to publish thousands of dollars worth of advertisements because they tended to deceive the public on matters of health. Instead of losing, the Journal has profited by so doing. 'Honesty is the best policy' not only according to 'Poor Richard', but according to experience also."[1]

Cause of Polio-myelitis.—"Cornil, in 1863, basing his deductions on the postmortem examination of cases dying of subsequent disease, described this condition as one of primary cell degeneration, having its selective action upon the gray matter of the anterior horns and nerve fibers arising there. * * * Recent writers have uniformly accepted the careful researches made by Harbitz, and Scheel, of Christiana, during the Norwegian epidemic of 1905 and 1906 as the basis for the established pathology of Polio-myelitis. * * * The exhaustive experiments upon monkeys, made by Flexner and Lewis * * * have proved beyond doubt that the disease is due to an infection by some living reproducing organism, probably ultramicroscopic in size. * * *"[2]

"A few years ago Massachusetts, recognizing its possible contagious nature, placed it among her reportable diseases, and in the past few months after the fact of its contagion had been clearly proven other states followed this lead and now some six or seven require a prompt report of all cases, just as they do of scarlet fever, diphtheria, etc. The Board of Health of the

1. Editorial. Mistaken Self-Interest. Sou. Med. Jour., **4**: 247, 1911.

2. Wilson, O. H.: Pathology of Anterior Poliomyelitis. Ibid. p. 298.

State of Tennessee at its last meeting passed such a resolution. * * * Should we be so fortunate as to diagnose our case early the question of how to manage the acute onset confronts us. * * * As for drugs, many have been used and each one has its champion. * * * Recently urotropin has been advised, since after its administration formaldehyde is found in the cerebrospinal fluid. * * * Its administration can do no harm. * * *"[1]

1. Harris, A. W.: Treatment of Acute Anterior Polio-myelitis. Ibid, p. 303.

Baltimore—Where We Meet

Southern Medical Association, Thirtieth Annual Meeting, Baltimore, Maryland, November 17-20, 1936

RECREATIONAL BALTIMORE*

Baltimore, where the Southern Medical Association will hold its annual meeting from November 17 to 20, is one of the outstanding cities in the East in its offering of a wide diversity of means for recreation and pleasure for those who have been surfeited with business or other labors. This is true because of the city's ideal geographical location, its spacious harbor, its chain of lovely parks, its well-known reputation for hospitality and the many points and objects of interest within its confines.

The city, which is 207 years old, contains a hundred or more points of interest, historical, educational and otherwise, many of which take one back to the early days of the Republic. Some of the leading institutions are the Johns Hopkins University, Hospital and Medical School groups; the University of Maryland, with its School of Medicine of which the Baltimore Dental College is a part; Goucher College for Women and numerous other institutions of learning, religious and otherwise. The principal ones can be seen in a few hours during a properly conducted tour.

For those who would mix a bit of recreation with scientific matters, Baltimore, in the fall season, has to offer racing (the Bowie track, only a short drive from this city, will hold its meet from November 12 to 28), golf, football and other athletic events, the theater, legitimate and motion picture, worth-while musical events, fishing in the Chesapeake Bay and its many tributaries, sightseeing in general, boat trips down the Patapsco River and the Chesapeake as far as the Virginia Capes, short trips by boat, rail or automobile to near-by points of historic or other interest.

Annapolis, the State Capital and home of the United States Naval Academy, is only 28 miles from Baltimore. Washington, the National Capital, is only 40 miles distant. Valley Forge and the Gettysburg and Antietam battlefields, one in Pennsylvania, the other in Maryland, can be reached within a few hours by automobile. Likewise there are both mountain and seashore resorts in Maryland and near-by states.

Athletic events are held at Annapolis all during the fall and winter. These include boxing, wrestling, fencing, etc. On the evening of November 16, just before the convention opens its sessions, the chief musical event in Baltimore will be the Monte Carlo ballet. On November 21 (Saturday), the day following the close of the convention, the annual football game between the Baltimore City College and the Baltimore Polytechnic Institute, a local football classic, will take place in the Baltimore Stadium, in which many big games are played. Two of the major contests in the Stadium—Navy vs. Yale and Navy vs. Notre Dame—will have been played before the convention meets. Johns Hopkins has no athletic events of note during the convention period, nor has the University of Maryland.

Opportunities galore there will be for golf. Baltimore boasts of many celebrated courses. These include Five Farms, Rolling Road, Hillendale, Suburban, Baltimore Country, Rodgers Forge, Elkridge and Bonnie View. In addition there are fine courses in a majority of the municipal parks.

Visitors who wish to go on sightseeing trips will find it agreeable to plan one by boat, and the other by automobile.

If any of the convention guests desire to remain over for a period to enjoy fishing, this can be done in de luxe fashion if the fishermen care to go down the Chesapeake Bay. This is the most prolific body of water of its kind and size in the world (crabs, oysters and terrapin in addition to fish of many varieties) in the vicinity of the Virginia Capes, where a party of four recently caught 53 channel bass ranging in weight from 35 to 68 pounds each.

*From the Convention Bureau, Baltimore Association of Commerce, Mr. A. Russell Phillips, Director.

Book Reviews

The Parathyroids in Health and in Disease. By David H. Shelling, B.Sc., M.D., the Johns Hopkins University and Hospital, Baltimore. 335 pages, illustrated. St. Louis: The C. V. Mosby Company, 1935. Cloth, $5.00.

Parathyroid disease is approaching a place of accuracy in clinical diagnosis which equals that of diabetes and thyroid disease. Reports of surgical extirpation of parathyroid tumors are increasingly frequent and results, when diagnosis is careful, would seem to justify the means.

Shelling describes ably and accurately the history, anatomy, pathology and physiology of the parathyroids, the hormone, its relation to vitamin D, and the diseases definitely associated with disturbances of these glands. Calcium and phosphorus metabolism are necessarily discussed, and low calcium and low phosphorus diet lists are appended. The chapter on the use and misuse of parathyroid hormone and of parathyroidectomy is particularly valuable. The numerous conditions for which either hormone injections or parathyroid surgery has been tried are ably reviewed. This is an excellent reference work and clinical evaluation of a topic of practical current interest.

Clinical Heart Disease. By Samuel A. Levine, M.D., F. A. C. P., Assistant Professor of Medicine, Harvard Medical School; Senior Associate in Medicine, Peter Bent Brigham Hospital, Boston; Consultant Cardiologist, Newton Hospital; Physician, New England Baptist Hospital, Boston. 445 pages, illustrated. Philadelphia: W. B. Saunders Company, 1936. Cloth, $5.50.

The increasing incidence of heart disease and the recognition by physicians of its first rank in importance as a cause of death and disability has led to the publication of many books on the heart in recent years. Levine's volume is decidedly not "just another book." It impresses the reviewer as representing the most accurate, clear, concise and at the same time comprehensive discussion of the subject which has appeared in any language. Although planned primarily for physicians in general practice it has much to teach the internist and cardiologist.

The first half of the book is given over to a discussion of the various important etiological types of heart disease. This section contains relatively few new important principles but has an abundance of small clinical points of practical significance which are original on the part of the author and unfamiliar to most men in the field. Following these chapters there is a masterly discussion of paroxysmal rapid heart action. This chapter is perhaps the best discussion ever written on this subject. The chapters on acute cardiovascular emergencies, the clinical significance of the systolic murmur and surgical and obstetrical aspects of cardiac problems are gems and need to be read to be appreciated. The succeeding two chapters dealing with prognosis and with treatment are also excellent. The final hundred pages deal with the clinical applications of electrocardiography. Here in condensed form may be found all the important applications of this subject to the problems of interpretation of arrhythmias, of coronary arterial disease and of other myocardial disorders. In recent years most writers on the heart have been inclined to overemphasize electrocardiography. Levine avoids this pitfall and stresses throughout the section the bedside recognition of arrhythmias. He realizes clearly that this very valuable but complex instrumental approach can never be substituted for the careful history or for the information to be obtained from the stethoscope.

If the book has any faults they are minor ones. It might have been well for the author to have emphasized in more detail the clinical significance and the methods of recognition of cardiac enlargement. Some of the speculations concerning the importance of constitutional factors could have been omitted without harm to the text. However, they add a note of piquancy and the author clearly recognizes their speculative nature. A chapter on the information to be obtained from fluoroscopy of the heart would have been useful.

The great virtue of this book is that it consists not of a compilation from the literature but of the author's own experience and points of view. Every chapter shows indications of having been written by a man who is a master clinician in the field. All the chapters are good. Those on arrhythmias and electrocardiography are positively brilliant.

Cardiac Output and Arterial Hypertension. By Sidney A. Gladstone, M.D., New York City, 1935. Cloth, $1.00.

This is a small monograph dealing with the dynamics of the circulation. The first portion is concerned with the author's criticism of existing methods of measuring cardiac output and with his presentation of data which he interprets as supporting the validity of his own modification of the acetylene procedure. The data given are not convincing. In the next section the author appears to be on firmer ground in that he presents work which points toward the conclusion that the increase in blood pressure in hypertensive patients is dependent not on a greater pumping function of the heart but on augmented peripheral resistance. In the final section, which is entirely speculative, the author's ideas concerning the pathogenesis of renal hypertension are discussed and some interesting concepts are presented. The author's hypotheses seem reasonable enough but cannot be accepted until he presents experimental data in support of them.

Royat Treatment in Cardiovascular Disease. By Pierre Noel Deschamps, M.D., (Paris) Assistant Physician in Charge of the Cardiological Department, Lariboisiere Hospital, Paris. 108 pages. Baltimore: William Wood and Company, 1935. Cloth, $2.00.

This is a small book in which the author's ideas concerning the value of baths in the treatment of cardiovascular diseases are discussed. He concludes that carbon dioxide thermal treatment is of fundamental importance in these conditions. The critical reader, while not questioning the improvement displayed by the patients discussed, will not be willing to concede that the evidence presented justifies the author's conclusion as to the value of the baths. Patients who take a sea voyage or who simply leave the accustomed routine and undergo a period of rest and diversion away from their homes often show similar benefit.

Until more carefully controlled studies are made, American physicians will continue to maintain a skeptical attitude toward the enthusiasm of their European colleagues toward carbon dioxide baths.

At the end of the book an extensive bibliography on the subject is appended.

Minor Surgery. By Frederick Christopher, S.B., M.D., F.A.C.S., Associate Professor of Surgery at the Northwestern University Medical School, Chicago; Chief Surgeon at the Evanston (Ill.) Hospital. With a foreword by Allen B. Kanavel, M.D., F.A.C.S., Professor of Surgery at the Northwestern University Medical School. Third Edition, Reset. 1030 pages, illustrated. Philadelphia: W. B. Saunders Company, 1936. Cloth, $10.00.

The third edition of "Minor Surgery" is a valuable reference for the surgeon, especially the junior surgeon.

The contents of its one thousand pages are arranged in an anatomical order; it deals with every imaginable condition, the more common problems receiving proportional consideration. Diagnosis and prognosis are considered, but major emphasis is placed on treatment. There are abundant photographs and many schematic illustrations. The bibliography is extensive and well chosen.

Injuries, infections, tumors and deformities of the head, neck, trunk, upper and lower extremities are considered in order. The anus, rectum, male and female genito-urinary systems are allotted limited space by the author. At the end of the book there is a chapter on surgical technic, describing in detail methods in general use from administration of a hypodermic to description of the various methods of transfusion, procedures which the intern is generally erroneously presumed to know.

In the third edition the author has made his text more practical and brought it up to date; numerous new subjects have been added. "Minor Surgery" is all inclusive in material, yet it is well proportioned, easily read, well illustrated and clear in its detail.

Diseases of the Respiratory Tract. Eighth Annual Graduate Fortnight of the New York Academy of Medicine. Contributors: J. Burns Amberson, Jr., M.D.; George Blumer, M.D.; Henry T. Chickering, M.D.; Lloyd F. Craver, M.D.; A. Raymond Dochez, M.D.; Leroy U. Gardner, M.D.; Yandell Henderson, Ph.D.; Charles J. Imperatori, M.D.; Chevalier L. Jackson, M.D.; Adrian V. S. Lambert, M.D.; Howard Lilienthal, M. D.; Harrison S. Martland, M.D.; Jonathan C. Meakins, M.D.; James Alexander Miller, M.D.; Eugene H. Pool, M.D.; Charles T. Porter, M.D.; Maximilian A. Ramirez, M.D.; Arnold Rice Rich, M.D.; David Riesman, M.D.; Charles Hendee Smith, M.D.; Harry Wessler, M.D. 418 pages, illustrated. Philadelphia: W. B. Saunders Company, 1936. Cloth, $5.50.

The book is a compilation of the clinics, lectures, demonstrations and exhibits upon diseases of the respiratory tract of the Eighth Annual Graduate Fortnight of the New York Academy of Medicine for 1936. Each subject is presented by an outstanding clinician.

The material is precisely and briefly presented in an orderly sequence. Of especial interest are the chapters upon the common cold by Dochez, bronchiectasis by Amberson, chronic pneumonitis by Jonathan C. Meakins, pneumonoconiosis by Gardner, pulmonary thrombosis and embolism by Blumer, and carcinoma of the lungs by Craver.

Monographs of this type present to the practitioner in a condensed form the information concerning special systems, saving him the time of wading through a voluminous literature. It has a real place in medical literature.

Interpretation of Laboratory Findings. By Raymond H. Goodale, M.D., Pathologist, City Hospital, Worcester, Massachusetts, Visiting Pathologist, Belmont and Fairlawn Hospitals, Worcester, Massachusetts, Harrington Memorial Hospital, Southbridge, Massachusetts, and Baldwinville Hospital Cottages, Baldwinville, Massachusetts; Assistant Professor of Experimental Pathology, Boston University School of Medicine, Boston, Massachusetts. 170 pages, illustrated. Philadelphia: F. A. Davis Company, 1936. Cloth, $2.25.

While all the data contained in this book can be found in larger volumes, its compactness will appeal to many physicians. The writer has divided the text into four parts. In the first he gives the normal values for content of body fluids and secretions, and the interpretation of abnormal values. The second part lists the diseases and laboratory procedures that are of value in diagnosis; the third the physiology of the body fluids and excreta, while the last part deals with the collection of laboratory specimens. The author brings to the attention of the reader laboratory procedures which will be of value in the presence of certain symptoms. It will tend to spare the inconvenience and expense of useless examinations.

Pediatric Nursing. By John Zahorsky, A.B., M.D., F.A.C.P., Professor of Pediatrics and Director of the Department of Pediatrics, St. Louis University School of Medicine; Assisted by Beryl E. Hamilton, R.N., Graduate of St. Luke's Hospital, St. Louis. 568 pages, illustrated. St. Louis: C. V. Mosby Company, 1936. Cloth, $3.00.

Any book by a man so well and favorably known as is Dr. Zahorsky will attract attention. Many would have preferred that the book be written for the practitioner instead of the nurse to permit the author more opportunity to reveal his clinical lore.

The accepted form for a text-book for nurses is followed. The points to be stressed are often tabulated, the paragraphs are headed with descriptive subjects, and finally there are lists of questions at the end of each chapter. The illustrations are complete and descriptive.

Aids to Medicine. By James L. Livingstone, Physician to King's College Hospital; Assistant Physician to the Hospital for Consumption and Diseases of the Chest, Brompton. Fifth Edition. 422 pages. Baltimore: Wm. Wood & Company, 1935. Cloth, $1.50.

Salient facts are given in this small pocket size book, which shows careful work and is authoritative.

Southern Medical News

ALABAMA

Dr. Marion T. Davidson, Birmingham, was elected President of the Chattahoochee Valley Medical Association at its annual meeting at Radium Springs, Georgia, July 14 and 15.

The Alabama Pediatric Society has elected the following officers for the coming year: Dr. W. A. Clyde, Fairfield, President; Dr. J. H. Baumhauer, Mobile, Vice-President; Dr. M. G. Neely, Fairfield, Secretary-Treasurer.

Dr. J. F. Sewell and Dr. J. S. Harmon opened the Wetumpka General Hospital on May 24.

Dr. C. B. Spencer, formerly of New Orleans, Louisiana, has moved to Mobile.

Dr. Joseph P. Chiasson, formerly of Mobile, has moved to New Orleans, Louisiana.

Deaths

Dr. John Leonard Reynolds, Ozark, aged 65, died recently.

Dr. Thomas Jackson Russell, Somerville, aged 65, died recently of chronic nephritis and uremia.

Dr. John T. Hunter, Equality, aged 71, died March 22.

Dr. Benjamin Brittain Simms, Talladega, aged 76, died recently of uremia.

Dr. Andrew Jackson Morris, Newton, aged 73, died March 15.

ARKANSAS

Dr. T. T. Ross, Arkadelphia, has been made Director, Division Maternal and Child Health, of the State Health Department.

Dr. W. Myers Smith, Morrilton, has been made Director of the Health Center of that city.

Dr. W. P. Scarlett, Morrilton, has been made Director, Conway County Health Unit.

Dr. Roy James Turner, North Little Rock, has been made Director of District Number One Health Unit.

Dr. W. Myers Smith and Dr. W. P. Scarlett, Morrilton, have returned after taking special work in Boston, Massachusetts.

Dr. Roy James Turner and Dr. J. K. Grace, North Little Rock, recently took postgraduate work in Nashville, Tennessee.

Dr. S. F. Hoge has been made Vice-Chancellor and Dr. Val Parmley, Surgeon, of the Little Rock Chapter of the Military Order of the World War.

Dr. George V. Lewis, Little Rock, has been made Division Surgeon for the Missouri Pacific Hospital of that city.

Dr. S. C. Fulmer, Little Rock, has been made Assistant Dean and Head of the Department of Medicine of the University of Arkansas School of Medicine.

Dr. J. J. Monfort, formerly of Cleveland, Ohio, has moved to Batesville, where he is Chief Surgeon of Dr. Gray's Infirmary.

Dr. M. S. Craig, Batesville, has returned after taking postgraduate work in New York.

Dr. R. H. Willett, Jonesboro, recently took postgraduate work in Chicago.

Dr. L. G. Fincher, El Dorado, has returned after taking postgraduate work in Chicago.

Deaths

Dr. James D. Watts, Dumas, aged 60, died recently.

Dr. William Enoch Pollett, Hickory Ridge, aged 76, died recently.

Dr. T. J. Garner, Washington, aged 76, died March 13.

Dr. George Heinrich Braun, Fort Smith, aged 73, died March 12.

Dr. Byron C. Sorrels, Mansfield, aged 70, died recently.

Dr. Felix Melville Scott, Paragould, aged 72, died June 17.

DISTRICT OF COLUMBIA

The Medical Society of the District of Columbia has elected the following officers for the coming year: Dr. William Mercer Sprigg, Washington, President; Dr. Coursen B. Conklin, Washington, Secretary.

Dr. Daniel L. Finucane, formerly of Glenn Dale, Maryland, has been made Associate Professor of Clinical Medicine at Georgetown University School of Medicine.

Deaths

Dr. Claudius Junius Young, Washington, aged 55, died March 21.

Dr. William Hemple Arthur, Washington, aged 80, died April 19.

FLORIDA

Dr. J. H. Pound, Chattahoochee, has resigned as Chief Physician of the Florida State Hospital.

Dr. B. A. Burks, Winter Park, is attending clinics in London and Edinburgh.

Dr. C. D. Hoffman, Orlando, has moved to East Robinson and Magnolia Avenues.

Dr. A. E. Drexel, formerly of Palatka, has moved to Daytona Beach.

Deaths

Dr. John Howard Johnson, Windermere, aged 62, died March 20.

Dr. Erle Leslie Biggs, Starke, aged 44, died March 22 of pneumonia.

Dr. Thomas A. Hightower, Jacksonville, aged 85, died March 9.

Dr. Charles Stockton Stafford, Tampa, aged 70, died March 24 of carcinoma of the bladder.

Dr. Gordon Stanton, Hastings, aged 66, died March 31 of chronic myocarditis.

GEORGIA

The Cobb County Medical Society has elected the following officers for the coming year: Dr. W. G. Crawley, Jr., Acworth, President; Dr. W. C. Mitchell, Smyrna, Vice-President; Dr. H. B. Terry, Acworth, Secretary-Treasurer.

The State Child Health and Welfare Council has elected the following officers for the coming year: Dr. M. Hines Roberts, Atlanta, Chairman; Dr. J. P. Bowdoin, Atlanta, Secretary-Treasurer.

The Atlanta Cancer Clinic has elected the following officers for the coming year: Dr. J. L. Campbell, Director; Dr. Rufus T. Dorsey, President of the Staff; Dr. Cosby Swanson and Dr. Charles Rushin, Vice-Presidents; Dr. J. G. McDaniel, Secretary-Treasurer.

Dr. W. B. Schaeffer, Toccoa, was recently made Captain in command of a new unit of the Georgia National Guard.

Dr. W. C. Miles, Griffin, was recently made Commander of the Troy Barnett Post of the American Legion.

Dr. William D. Jennings, Jr., Augusta, has been made Police and Fire Surgeon of that city.

The Mitchell County Medical Society has elected Dr. M. M. Burns, Pelham, Secretary-Treasurer.

The Chattahoochee Valley Medical Association held its annual meeting at Radium Springs July 14-15.

Dr. Albert A. Rayle, Atlanta, has moved into the Doctors Building.

The Laurens County Medical Society was recently entertained by Dr. O. H. Cheek, Dublin, on his houseboat on the Oconee River.

The Troup County Medical Society was entertained on June 29 by Dr. R. S. O'Neal, LaGrange.

Deaths

Dr. P. L. Collinsworth, Atlanta, aged 63, died March 17.

Dr. George W. Ragsdale, Hiram, aged 58, died March 25.

Dr. Robert L. Miller, Waynesboro, aged 65, died recently of hypertension and nephritis.

Dr. William T. McKinney, Cave Springs, aged 71, died recently.

Continued on page 22

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Continued from page 882

Dr. Harry Bell Nunnally, Monroe, aged 53, died May 13.
Dr. William Emmett Rouse, Valdosta, aged 74, died May 26.
Dr. James M. Freeman, Lavonia, aged 67, died May 16.
Dr. Lovick Thomas Pattillo, Atlanta, aged 61, died May 12.
Dr. James Lewis Lee, Pinehurst, aged 58, died May 16.
Dr. H. W. Orr, Dublin, aged 75, died recently of cerebral hemorrhage.

KENTUCKY

Dr. Alfred F. Smith, Georgetown, has been made Health Officer of Greenup County to succeed Dr. Carl M. Gambill.
Dr. Robert L. Kelley, Louisville, announces the association with him of Dr. Charles G. Baker.
Dr. Carl Weidner, Jr., Louisville, has moved into the Francis Building.

Deaths

Dr. Wilgus Bach, Jackson, aged 49, died April 28 of pneumonia.
Dr. George N. Cox, Mount Sterling, aged 74, died April 15 of intestinal obstruction.
Dr. Frank Jewel Nooe, Harrodsburg, aged 60, died March 24 of pneumonia.
Dr. John Knox Polk, Lexington, aged 52, died recently.

LOUISIANA

Dr. Phillips J. Carter, New Orleans, has been elected President of the New Orleans Gynecological and Obstetrical Society.
Dr. Hilliard E. Miller, New Orleans, has been made Chief of the Department of Gynecology at Touro Infirmary to succeed his brother, the late Dr. Charles Jefferson Miller.
The Tri-Parish Medical Society was entertained at a chicken dinner at Lake Providence on July 7.
Dr. Joseph P. Chiasson, formerly of Mobile, Alabama, has moved to New Orleans.
Dr. C. B. Spencer, formerly of New Orleans, has moved to Mobile, Alabama.
Dr. H. M. Heitsch, formerly of New York, has moved to New Orleans.
Dr. Paul E. Walker, formerly of Los Angeles, California, has moved to New Orleans.
Dr. H. E. Trimble, formerly of San Francisco, California, has moved to New Orleans.

Deaths

Dr. Francis Scrimzeous Furman, Shreveport, aged 66, died April 12 of pneumonia.
Dr. Foster Matthew Johns, New Orleans, aged 46, died April 30 of cerebral hemorrhage.
Dr. Felix Jefferson Willey, Mer Rouge, aged 45, died March 26.

MARYLAND

Dr. Eduard Uhlenhuth, University of Maryland School of Medicine, Baltimore, has been awarded the Van Meter Prize of the American Association for the Study of Goiter.
Dr. Lester J. Dugan, formerly of Clarendon, Virginia, has located at Goldsboro.

Deaths

Dr. Frank J. Flannery, Baltimore, aged 77, died recently of carcinoma of the prostate.
Dr. Read McLane Ellsworth, Baltimore, aged 37, died April 28 of pulmonary tuberculosis.
Dr. Edgar Speiden, Silver Spring, aged 69, died March 15 of cerebral hemorrhage and cardiac hypertrophy.
Dr. John Andrew Doerner, Cumberland, aged 79, died April 7 of bronchopneumonia and cardiac dilatation.
Dr. Gustav F. Boucsein, Baltimore, aged 75, died March 27 of chronic myocarditis.
Dr. Philip Gustav Dill, Baltimore, aged 73, died recently.
Dr. Emily C. Peterson, Baltimore, aged 75, died recently of bronchopneumonia.

Continued on page 24

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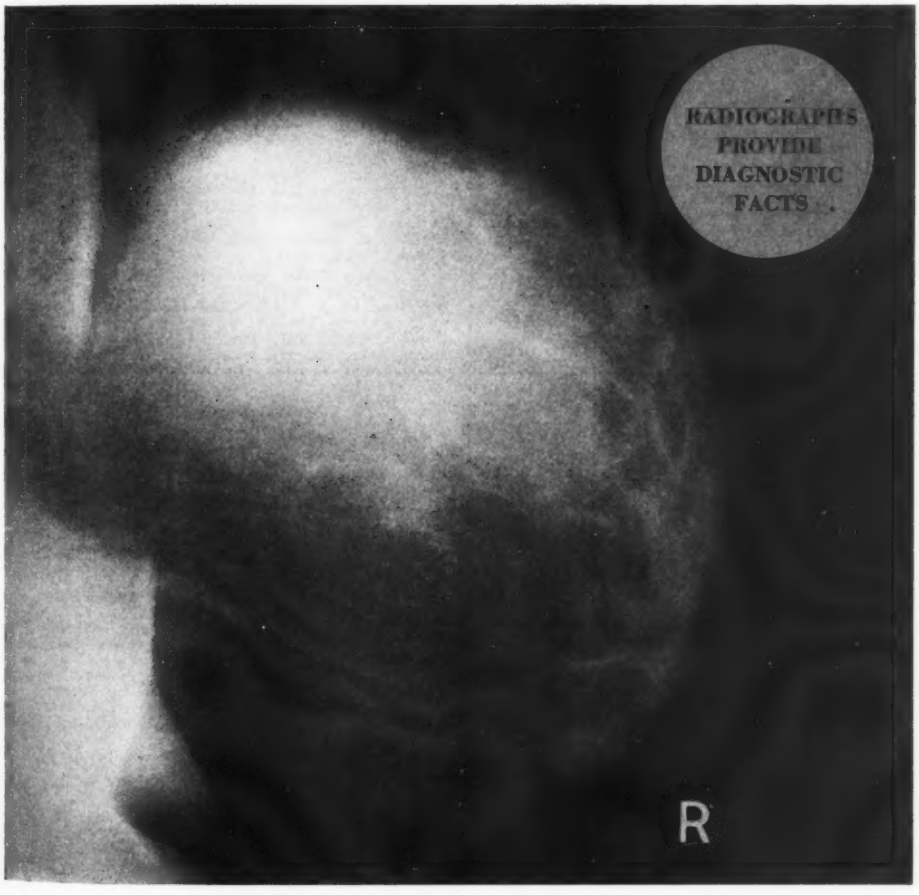

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Continued from page 22

MISSISSIPPI

The Mississippi State Pediatric Society met in Jackson on July 2. The following officers were elected for the coming year: Dr. Harvey F. Garrison, Jackson, President; Dr. John Bullock, Jackson, Vice-President; Dr. Guy Jarratt, Vicksburg, Secretary-Treasurer.

A Course of Postgraduate Lectures in Pediatrics, consisting of five lectures a week (1) Newborn, (2) Nutritional Requirements in Infancy, (3) Nutritional Diseases in Infancy and Childhood, (4) Immunizations, and (5) The Most Frequent Causes of Vomiting in Infancy, and continuing for ten consecutive weeks in ten different centers in Mississippi, began at Clarksdale on July 6. The lectures will be given by Dr. Robert A. Strong, New Orleans, Professor of Pediatrics, Tulane University School of Medicine. The Course is sponsored by the Mississippi State Medical Association, the Mississippi State Hospital Association, the Mississippi State Board of Health, and Tulane University School of Medicine and Graduate School of Medicine. The Committee on Postgraduate Medical Education, in charge of the Course, is composed of Dr. Harvey F. Garrison, Jackson, President of the Mississippi State Medical Association; Dr. J. W. Lipscomb, Columbus, President, Mississippi State Board of Health; Dr. Felix J. Underwood, Jackson, State Health Officer of Mississippi; Dr. C. C. Bass, New Orleans, Dean of Tulane University School of Medicine; Dr. H. W. Kostmayer, New Orleans, Dean of Tulane University Graduate School of Medicine; Dr. Leon S. Lippincott, Vicksburg, Secretary, Mississippi State Hospital Association; and Dr. W. H. Anderson, Booneville, Editor, *The Mississippi Doctor*, official organ of the Mississippi State Medical Association.

Dr. John S. Hickman, Philadelphia, has been made Superintendent of the East Mississippi Hospital, Meridian, to succeed Dr. Russell R. Welch.

Dr. Toxey E. Hall, Shelby, has been made Superintendent of the State Charity Hospital, Jackson, to succeed Dr. DeWitt T. Brock.

Dr. Louis M. Magee, Prentiss, has been made Superintendent of the State Charity Hospital, Natchez, to succeed Dr. William K. Stowers.

Dr. Thomas R. Beech, Ellisville, has been made Superintendent of the South Mississippi Charity Hospital to succeed Dr. Alcus J. Carter.

Dr. F. M. Sandifer and Dr. W. E. Denman, Greenwood, have moved to Market Street.

The George County Medical Unit has elected the following officers for the coming year: Dr. R. F. Ratliff, Lucedale, President; Dr. A. K. McMillan, Lucedale, Vice-President; Dr. J. L. Spiceland, Lucedale, Secretary.

The Mississippi State Hospital Association has elected the following officers for the coming year: Dr. A. M. McCarthy, Electric Mills, President; Dr. A. Street, Vicksburg, Vice-President; Dr. Leon S. Lippincott, Vicksburg, Secretary-Treasurer.

DEATHS

Dr. Sidney Adnir Brevard, Deeson, aged 50, died April 19 of uremia.

Dr. William H. Pickering, Collins, aged 74, died recently of carcinoma of the face.

Dr. Grover Cleveland Davis, Pelahatchee, aged 47, died recently of pellagra and tuberculosis of the lungs.

MISSOURI

Dr. T. Guy Hetherlin has been made Health Officer of Louisiana.

Dr. Richard Lee Russell, Springfield, has been made Assistant Director, Division of Child Hygiene, Missouri State Board of Health.

Dr. Theodore R. Meyer, formerly of Paw Paw, Michigan, has been made Health Commissioner of St. Louis County.

Dr. Leon Asher, Professor of Physiology, University of Berne, Switzerland, was a recent speaker at Washington University School of Medicine, St. Louis.

DEATHS

Dr. Mattylee Curl Barnett, St. Louis, aged 57, died April 19 of chronic myocarditis.

Dr. Charles Augustus Vosburgh, St. Louis, aged 57, died April 19 of heart disease.

Continued on page 26

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Continued from page 24

Dr. Theodore William Schaefer, Kansas City, aged 76, died recently of pneumonia.

Dr. Adeline Goodrich Soule, Kansas City, aged 82, died March 29 of senility.

Dr. Frank Allison Brown, Stockton, aged 56, died recently.

Dr. Ransom B. Lynch, Plato, aged 90, died March 8.

Dr. Henry Havre Look, Kansas City, aged 59, died recently of pneumonia.

Dr. Eugene R. Vanmeter, Springfield, aged 52, died recently.

Dr. William P. Donovan, St. Louis, aged 40, died March 15 of injuries received in an airplane crash.

Dr. Harry S. Lane, Kansas City, aged 61, died April 14.

Dr. Frederick D. Leiser, Kansas City, aged 83, died April 17.

Dr. Edgar A. Lewis, Rock Port, aged 58, died recently.

Dr. David A. Williams, Niangua, aged 81, died May 9 from pneumonia.

Dr. Thomas Joseph Ragsdale, Lee's Summit, aged 63, died recently.

NORTH CAROLINA

Thirty-nine medical students received the degree of Doctor of Medicine and twelve the degree of Bachelor of Science in Medicine at the graduating exercises held at Duke University School of Medicine, Durham, on June 8. Sixteen nurses received diplomas in nursing and one the degree of Bachelor of Science in Nursing at the same time.

Duke University School of Medicine, Durham, began the summer quarter on June 22 with forty-six students registered.

Dr. Wiley D. Forbus, Durham, Professor of Pathology, Duke University School of Medicine, has recently been made a member of the National Board of Medical Examiners, succeeding Dr. Howard K. Karsner.

Dr. Leroy J. Butler, Winston-Salem, has been made President of the North Carolina Pediatric Society.

Dr. William Blair Hunter, Gastonia, has been made Health Officer of Harnett County.

Dr. James W. Tankersley, Greensboro, has been made President of the North Carolina Academy of Surgery.

Dr. John S. Anderson, New Bern, has been made Health Officer of Craven County.

The North Carolina Public Health Association has elected Dr. Roderick M. Buie, Greensboro, President.

Dr. Harold D. Brewster, formerly of Oteen, has moved to Legion, Texas.

Dr. Cameron F. McRae, formerly of Clifton Forge, has moved to Bat Cave.

Dr. Donald Muro MacIntosh, Jr., Old Fort, and Miss Ruth Ellen Gish were married May 6.

Dr. Norman Owen Spikes, Durham, and Miss Vera Beatric Baldwin were married May 24.

Dr. James Carr Eagle, Spencer, and Miss Sadie Mondell Ellenburg were married May 16.

Dr. Jackson Townsend Ramsaur, Cherryville, and Miss Lucile Byrd Draughon were married May 30.

DEATHS

Dr. Horace Westlake Frink, Chapel Hill, aged 53, died April 18 of heart disease.

Continued on page 28

Classified Advertisements

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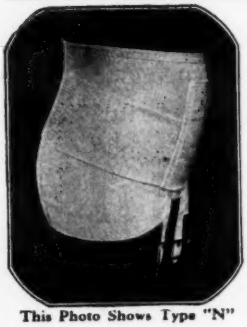

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For excellent therapeutic results in

Whooping Cough

Southern Doctors Prescribe

ELIXIR BROMAURATE

ELIXIR GOLD TRIBROMIDE

ELIXIR BROMAURATE cuts short the duration of the illness, reduces the frequency of the attacks, relieves the distressing cough and gives the child rest and sleep.

ELIXIR BROMAURATE is prescribed routinely by experienced physicians in all COUGH DISORDERS. Also valuable in the cough of PULMONARY TUBERCULOSIS and in BRONCHITIS and BRONCHIAL ASTHMA. Neurologists are using the Elixir with good effect in CHOREA, MIGRAINE and PETIT-MAL.

ELIXIR BROMAURATE is a standard, assayed and palatable preparation. In four-ounce original bottles; the dosage is a teaspoonful 3 to 4 times a day after meals or more often when necessary.

✓ **DOCTOR:—We will be glad to send you a valuable booklet on "Gold in the Treatment of Whooping Cough and other Diseases". Kindly drop us a line.**

GOLD PHARMACAL CO., New York

Continued from page 26

Dr. Augustus Washington Knox, Raleigh, aged 87, died May 9.

OKLAHOMA

Dr. Joseph B. Goldsmith, Oklahoma City, has been made Associate Professor of Histology and Embryology at the University of Oklahoma School of Medicine, Oklahoma City.

Dr. Joseph B. Carmichael, Duncan, has been made Health Officer of Stephens County, succeeding Dr. Dock Long, Duncan, deceased.

The Tulsa Clinical Society held its Spring Clinical Conference June 10-11.

Deaths

Dr. Everett E. Phillips, Oklahoma City, aged 80, died March 20.

Dr. Lundy Nathan Barnard, Muskogee, aged 58, died April 29 of angina pectoris

Dr. James Clinton Hawkins, Blackwell, aged 52, died May 15 from injuries received in an automobile accident.

Dr. Howard Alonzo Wagner, Shawnee, aged 61, died April 26 of coronary thrombosis.

Dr. Joseph Patterson Bishop, Aline, aged 61, died May 13.

Dr. Reuben Taylor Harrod, Oktaha, aged 69, died May 19.

Dr. Dock Long, Duncan, aged 76, died May 21.

Dr. John Sinclair Miller, Hugo, aged 59, died May 4.

Dr. John W. Sosbee, Stroud, aged 59, died May 20.

Dr. William McClure Leslie, Blackwell, aged 46, died March 25 of streptococcus infection of the blood stream.

SOUTH CAROLINA

The First District Medical Association has elected the following officers for the coming year: Dr. C. P. Ryan, Ridgeland, President; Dr. Riddick Ackerman, Jr., Walterboro, Vice-President; Dr. John van de Erve, Charleston, Treasurer.

Dr. Edward W. Perkins, Jr., formerly of Petersburg, Virginia, has moved to Sumter.

Deaths

Dr. James Monroe Austin, Columbia, aged 38, died April 24 of arterial hypertension and chronic nephritis.

Dr. Baylis Frank Sloan, Walhalla, aged 57, died March 23 of coronary occlusion.

Dr. Edgar F. Taylor, Clinton, aged 83, died March 27 of bronchopneumonia.

Dr. E. H. Wyman, Estill, aged 66, died March 25 of coronary thrombosis.

Dr. Donald Herman Hesse Till, Charleston, aged 32, died March 22.

TENNESSEE

The Middle Tennessee Medical Association has elected the following officers for the coming year: Dr. J. C. Pennington, Nashville, President; Dr. W. H. Avery, Shelbyville, Vice-President; Dr. D. W. Smith, Nashville, Secretary-Treasurer.

The Tennessee Radiological Society has elected the following officers for the coming year: Dr. John L. Hankins, Johnson City, President; Dr. H. S. Shoulders, Nashville, Vice-President; Dr. Franklin B. Bogart, Chattanooga, Secretary-Treasurer.

The Tennessee Academy of Ophthalmology and Otolaryngology has elected Dr. Ralph O. Rychener, Memphis, as President for the coming year.

The West Tennessee Medical and Surgical Association held its annual meeting in Jackson May 21.

Dr. John M. Lee, Nashville, has been made President of the Tennessee Pediatric Society.

The Upper Cumberland Medical Society held its annual meeting in Red Boiling Springs June 16-17.

Deaths

Dr. William Edward Black, Columbia, aged 54, died April 17 of cerebral hemorrhage.

Dr. Charles J. Bain, Camden, aged 58, died in March.

Dr. James Rhodes Hudson, Alexandria, aged 76, died March 1 of myocarditis.

Dr. Edward A. Jeffers, Chuckey, aged 53, died March 16.

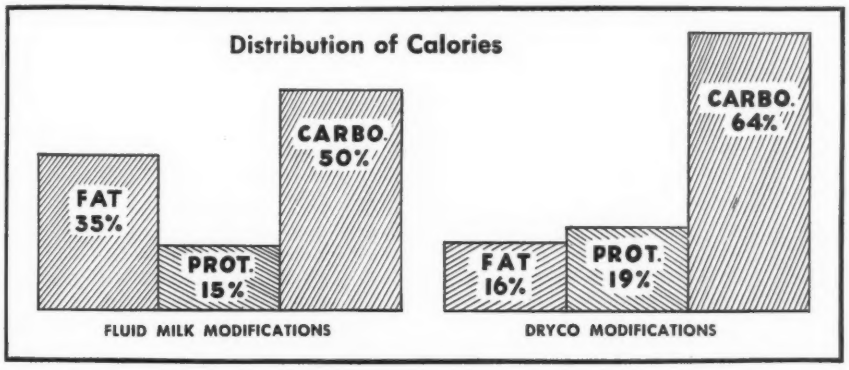
Continued on page 32

When the thermometer soars!

"It is probably wise to avoid formulas with high fat"...Holt & McIntosh
Diseases of Infancy and Childhood
ed.10, New York, 1933
Appleton-Century, p. 186

● A prolonged hot spell decreases the infant's digestive capacity, and diarrhea often follows. Effective safeguards against summer upsets are clean milk (Dryco is safe!) and a decrease in the fat content of the formula.

During the summer months many physicians turn to Dryco modifications for infant feeding. Compare the distribution of calories in a Dryco formula with commonly-used fluid milk modifications.



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The MALE SEX HORMONE SYNTHESIZED

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PERANDREN, "Ciba"

(TESTOSTERONE ACETATE)

About the middle of 1933 Prof. Ruzicka and his collaborators were successful in effecting the synthesis of a hormone which was shown to be identical with ANDROSTERONE, occurring naturally in the male urine. Further research work carried out by Ruzicka, in cooperation with Ciba chemists, led to the synthesis of TESTOSTERONE, the testicular hormone, far more potent than ANDROSTERONE, which latter indeed is now considered merely an excretory product.

More recently it has been demonstrated that TESTOSTERONE, in combination with certain organic acids, such as acetic acid, produces a considerably more prolonged effect on mammals than pure TESTOSTERONE. Therefore, the Ciba Company, Inc., New York, N. Y., is placing on the market—

PERANDREN, "Ciba"

(TESTOSTERONE ACETATE)

1 cc. ampules containing 5 milligrams in oil solution in boxes of three ampules. The price of Perandren to physicians is $6.50 per box. Please place orders through regular trade channels. Literature on Request.

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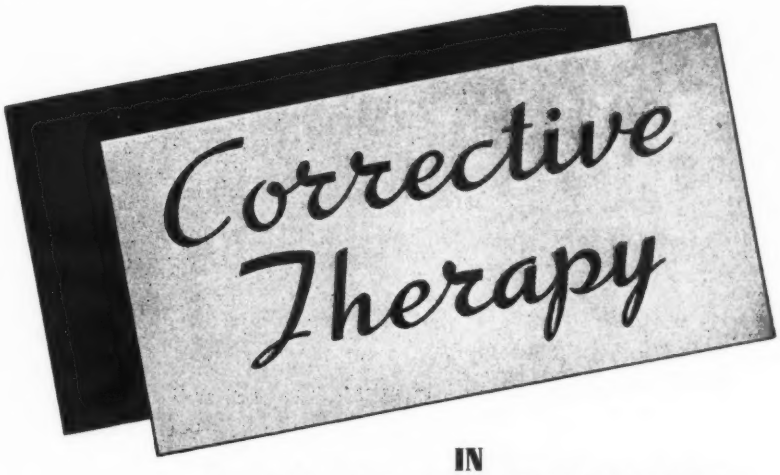
NEW YORK CITY, NEW YORK



IN

SPASTIC CONSTIPATION

Treatment directed at symptomatic relief can be only temporarily effective, because the patient will pass from the diarrheal stage into the costive stage without following any definite time cycle.

The object of therapeusis should be the administration of an agent which will prevent the segmented fragmentation of stools during the diarrheal stage and the elimination of hard, dehydrated fecal masses during the stage of constipation.

This is the secret of the success of

MUCILOSE

(STEARNS)

This hemicellulose prepared from the Plantago loeflingii supplies bland, non-irritating distention, lubricates without leakage, produces large, formed, soft stools, is easy to take, economical.

Mucilose is regulative to the spastic colon.

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Convenient
Delicious
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For Special Diets for Summer Uses

Also for excursions, traveling, etc.

HORLICK'S

The Original MALTED MILK

answers many problems of hot weather diet:

1. For infants and growing children.
2. In impaired digestion.
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HORLICK'S MALTED MILK CORP.
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precise ACCURACY
with Portability
and these exclusive features:
• Calibration 260 or 300 mm.
• Size 1¾" x 3¾" x 11¾".
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• Cast Duralumin Case.
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• Individually calibrated Pyrex glass tube.
• Steel reservoir.
• Unobstructed legible scale.
• Lifetime guarantee against glass breakage.
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• Price $29.50
KOMPAK MODEL
SMALLEST LIGHTEST HANDIEST
A TRUE MERCURY GRAVITY INSTRUMENT
Lifetime
Baumanometer
STANDARD FOR BLOODPRESSURE
W. A. BAUM CO. Inc. NEW YORK
SINCE 1916 ORIGINATORS AND MAKERS OF BLOODPRESSURE APPARATUS EXCLUSIVELY

Continued from page 28

Dr. James Robert Tyner, Murfreesboro, aged 29, died March 10 of scarlet fever.

Dr. B. M. Tittsworth, Jefferson City, aged 65, died May 11.

Dr. W. W. Core, Nashville, aged 77, died June 3.

TEXAS

The Texas State Heart Association has elected the following officers for the coming year: Dr. Edward H. Schwab, Galveston, President; Dr. George R. Herrmann, Galveston, Vice-President; Dr. Robert M. Barton, Dallas, Secretary.

The Texas Pediatric Society has elected the following officers for the coming year: Dr. George B. Cornick, San Antonio, President; Dr. John G. Young, Dallas, Vice-President; Dr. Frank Lancaster, Houston, Secretary-Treasurer.

The Texas Dermatological Society has elected the following officers for the coming year: Dr. C. M. Griswold, Houston, President; Dr. W. F. Spiller, Galveston, Vice-President; Dr. E. R. Seale, Houston, Secretary.

The Texas Railway Surgeons' Association has elected the following officers for the coming year: Dr. C. E. Scull, San Antonio, President; Dr. S. A. Woodward, Fort Worth, First Vice-President; Dr. J. H. Dorman, Dallas, Second Vice-President; Dr. Ross Trigg, Fort Worth, Secretary-Treasurer.

The Texas Neurologic Society has elected the following officers for the coming year: Dr. A. J. Schwenkenberg, Dallas, President; Dr. C. H. Standefer, Austin, First Vice-President; Dr. A. Hauser, Houston, Second Vice-President; Dr. Wilmer L. Allison, Fort Worth, Secretary-Treasurer.

Dr. Calvin R. Hannah, Dallas, was made President-Elect and Dr. Howard R. Dudgeon, Waco, was installed as President of the Texas State Medical Association at the annual meeting in Houston May 27.

Dr. J. S. Cooper has been made Health Officer of Greenville.

Dr. K. H. Beall, Fort Worth, has been made a Director of the Fort Worth National Bank.

Dr. W. L. Crosthwait, Waco, has been made head of the Texas Ex-Mississippians' Association.

Dr. W. B. Lasater, Mineral Wells, recently returned after taking postgraduate work at Rochester, Minnesota.

Dr. J. Edward Johnson, Mineral Wells, has returned after taking postgraduate work in Topeka, Kansas.

Dr. Harold D. Brewster, formerly of Oteen, North Carolina, has moved to Legion.

Dr. John Crafford Holman, Jr., Franklin, and Miss Margaret McKinzie were married June 20.

Deaths

Dr. Norman W. Gustine, Cleveland, aged 81, died in March of heart disease.

Dr. Russell Ellis Minter, Borger, aged 38, died March 18 of agranulocytosis.

Dr. John W. Bradfield, Austin, aged 58, died April 23 of coronary occlusion.

Dr. Dogan Pemberton, Houston, aged 33, died March 2.

Dr. Seth Gordon Hastings, San Antonio, aged 96, died March 24 of hypostatic pneumonia.

Dr. James A. Moore, Marshall, aged 62, died March 12.

Dr. Robinson Herman Salmon, Mertens, aged 64, died March 28 of pneumonia.

Dr. John Henry Phillips, Willis, aged 67, died March 11.

Dr. James Arthur Matthews, Mathis, aged 89, died March 14 of coronary occlusion.

Dr. John Buie, Hillsboro, aged 81, died May 3.

Dr. Thaddeus C. Colley, Grapevine, aged 51, died April 8.

Dr. J. P. Wier, Covington, aged 75, died April 30.

Dr. David Benjamin Beach, Hamilton, aged 52, died March 18.

Dr. Henry Culberson Amos, Denton, aged 51, died March 25 of pneumonia.

Dr. Elliott C. Prentiss, El Paso, aged 58, died May 4.

Dr. John Thomas McCullough, Quanah, aged 64, died April 4 of acute myocarditis.

Dr. Edward M. Thomas, Georgetown, aged 76, died April 4.

Dr. James Holland McCorkle, Gordon, aged 80, died April 17 of pneumonia.

VIRGINIA

The Fourth District Medical Society has elected the following

Continued on page 34

Schering Corporation
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SYNTHETIC MALE SEX HORMONES

ORETON* (crystalline testosterone)

ORETON-B* (crystalline dihydroandrosterone benzoate)

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These substances are synthesized in pure crystalline form in our Bloomfield, N. J., laboratories. Their chemical constitution has been established.

Present knowledge suggests that they should be of value in certain types of sexual deficiencies. Hypogonadism, infantilism, impotence, prostatism, psychic and nervous manifestations, and other conditions related to testicular insufficiency are now receiving the attention of clinical workers.

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Continued from page 32

officers for the coming year: Dr. Tom G. Hardy, Farmville, President; Dr. J. L. Hamner, Mannboro, Dr. W. W. Wilkinson, La Crosse, Vice-Presidents; Dr. C. E. Martin, Emporia, Secretary-Treasurer.

The Norfolk County Medical Society has elected the following officers for the coming year: Dr. Walter B. Martin, Norfolk, President; Dr. Frank H. Redwood, Norfolk, President-Elect; Dr. Thomas E. Oast, Portsmouth, Vice-President; Dr. Lockburn B. Scott, Norfolk, Secretary-Treasurer.

The Tri-State Hospital Association held its annual meeting at Old Point Comfort in April.

Dr. Edward M. Holmes, Jr., Richmond, has been made Health Officer of Fairfax County.

Dr. Charles Howe Eller, Charlottesville, formerly Health Officer of Albemarle County, has been made Assistant Director of Rural Health with the State Health Department.

Dr. Adrian L. Carson, Richmond, has been made Director of the Bureau of Maternal and Child Hygiene of the Health Department.

Dr. R. L. Raiford has been made one of the Directors of the Lions' Club of Franklin.

Dr. Stuart McGuire, Richmond, was made Chairman of the Board of Visitors of the Medical College of Virginia to succeed Mr. William T. Reed, deceased.

Dr. G. R. Maloney, Richmond, has been made President of the Manchester Lions' Club.

Dr. Edwin E. Barksdale, formerly of Charlottesville, has located in Danville.

Dr. J. C. Coulter, Charlottesville, has been made Grand Junior Warden of the Virginia Odd Fellows.

Dr. Paul J. Bundy has located in Dante.

Dr. J. P. Scott, formerly of Bedford, has moved to Martinsville.

Dr. George A. Reynolds, formerly of Norfolk, has moved to Bowling Green.

Dr. Edward W. Perkins, Jr., formerly of Richmond, has located in Sumter, South Carolina.

Dr. Rupert W. Powell, Roanoke, has opened offices in the Medical Arts Building.

Dr. K. K. Wallace, Norfolk, is taking postgraduate work in New York.

Dr. J. Lawson Cabaniss, Roanoke, has opened offices in the Colonial Bank Building.

Dr. Charles W. Purcell, formerly of Charlottesville, has moved to Danville.

Dr. Guy Winston Horsley, Richmond, and Miss Mary Clare Wright were married June 10.

Dr. Jefferson Bishop Kiser and Miss Margaret Mahood Johnston, both of Emporia, were married June 1.

Dr. William Rollan Hill, Charlottesville, and Miss Sherrard Pierson Parrish were married May 10.

Dr. Chester L. Riley, Richmond, and Miss Verna Parker were married June 8.

Dr. Morton Morris Pinckney, Richmond, and Miss Louise Lippitt Sinnickson were married May 16.

Dr. Leland Coffey Brown, Stuarts Draft, and Miss Marjorie Mower were married April 18.

Deaths

Dr. Frank Pyott, Tiptop, aged 60, died recently of angina pectoris.

Dr. George Sawyer Pitcher, Hampton, aged 72, died March 8.

Dr. Garland M. Vaden, Capeville, aged 58, died June 20.

WEST VIRGINIA

The West Virginia Obstetrical Society has elected the following officers for the coming year: Dr. Harry G. Steele, Bluefield, President; Dr. W. A. Cracraft, Wheeling, Vice-President; Dr. Edwin J. Humphrey, Huntington, Secretary.

Deaths

Dr. Curtis Thomas Hayden, Charleston, aged 51, died recently.

Dr. Frank Baker, Burlington, aged 73, died March 24 of cerebral embolism.

Direct Ovarian Therapy

A biologically assayed preparation of the ovarian follicular hormone. Stimulates the growth of the uterine muscle as well as the development of the vascularized hypertrophied endometrium necessary for the menstrual flow. For intensive treatment of amenorrhea, certain types of dysmenorrhea and the menopause.

BOXES OF 6 AMPOULES

400 international units in aqueous solution. 2000 international units in oil.

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THELESTRIN

OVARIAN FOLLICULAR HORMONE

Picnic Poisoning—

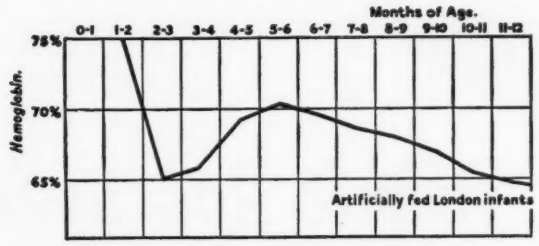
"PICNIC POISONING"—a gastro-intestinal symptom-group particularly prevalent on Mondays, characterized by symptoms of diarrhea, mild enteritis, flatulence and general abdominal discomfort.

HISTORY—a picnic, outing, or other occasion where large and varied amounts of food and drink were consumed with little regard to normal rules of diet.

TREATMENT—usually consists of elimination of the toxic, irritating material without irritation to the inflamed intestinal mucosa.... Kaomagma adsorbs intestinal toxins and soothes the inflamed mucosa. Being fluid, it mixes with the intestinal content, forming a soft mass easily evacuated without interference with normal digestion.

Kaomagma Plain and Kaomagma with Mineral Oil supplied in 12-oz. bottles.

Nutritional Anemia in Infants



Hemoglobin level in the blood of infants of various ages. Note fall in hemoglobin, which is closely parallel to that of diminishing iron reserve in liver of average infant. Chart adapted from Mackay. It is possible to increase significantly the iron intake of the bottle-fed from birth by feeding Dextri-Maltose With Vitamin B in the milk formula. After the third month Pablum offers substantial amounts of iron for both breast- and bottle-fed babies.

Reasons for Early Pablum Feedings

1. The iron stored in the infant's liver at birth is rapidly depleted during the first months of life. (Mackay,[1] Elvehjem.[2])

2. During this period the infant's diet contains very little iron—1.44 mg. per day from the average bottle formulae of 20 ounces, or possibly 1.7 mg. per day from 28 ounces of breast milk. (Holt.[3])

For these reasons, and also because of the low hemoglobin values so frequent among pregnant and nursing mothers (Coons,[4] Galloway[5]), the pediatric trend is constantly toward the addition of iron-containing foods at an earlier age, as early as the third or fourth month. (Blatt,[6] Glazier,[7] Lynch[8].)

The Choice of the Iron-Containing Food

1. Many foods reputed to be high in iron actually add very few milligrams to the diet because much of the iron is lost in cooking or because the amount fed is necessarily small or because the food has a high percentage of water. Strained spinach, for instance, contains only 1 to 1.4 mg. of iron per 100 gm. (Bridges.[9])

2. To be effective, food iron should be in soluble form. Some foods fairly high in total iron are low in soluble iron. (Summerfeldt.[10])

3. **Pablum is high both in total iron (30 mg. per 100 gm.) and soluble iron (7.8 mg. per 100 gm.) and can be fed in significant amounts without digestive upsets as early as the third month, before the initial store of iron in the liver is depleted. Pablum also forms an iron-valuable addition to the diet of pregnant and nursing mothers.**

Pablum (Mead's Cereal thoroughly cooked and dried) consists of wheatmeal, oatmeal, cornmeal, wheat embryo, brewers' yeast, alfalfa leaf, beef bone, iron salt and sodium chloride.

[1-10] Bibliography on request.

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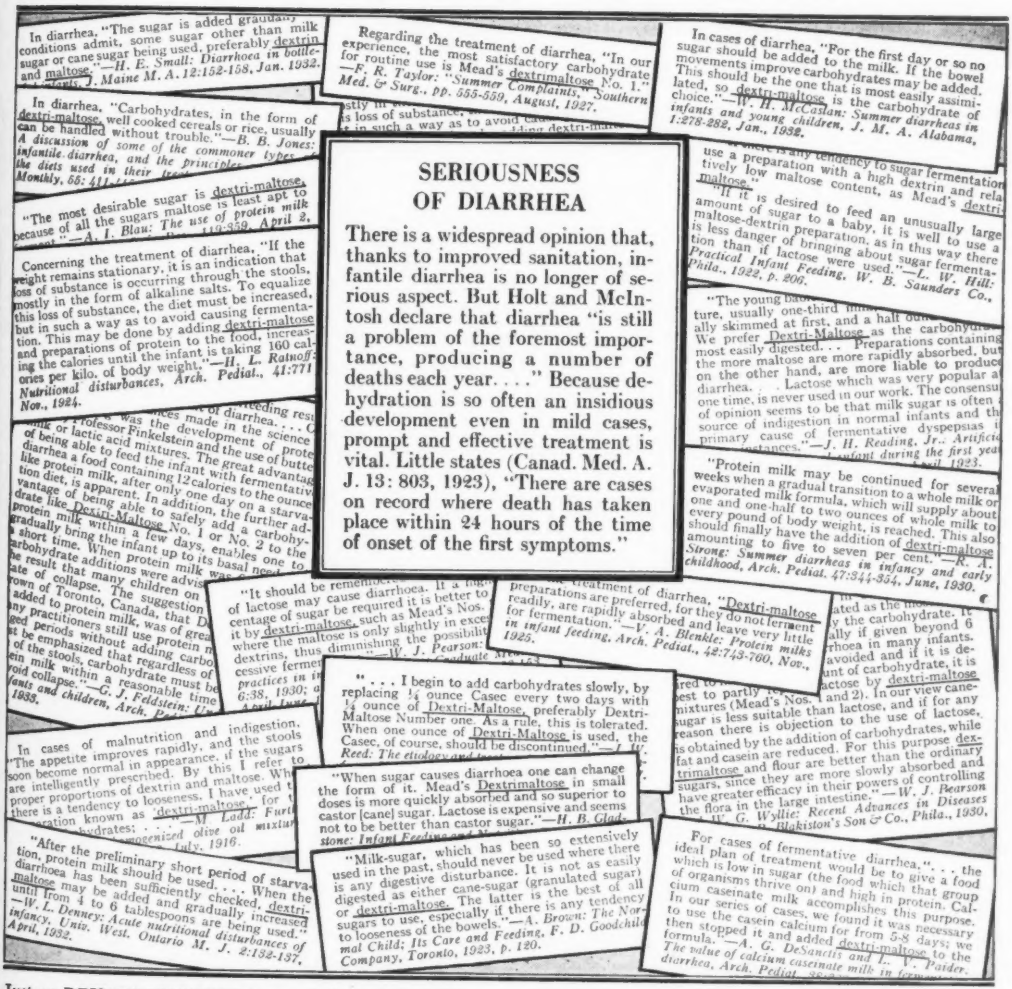
DIARRHEA

"the commonest ailment of infants in the summer months"

(HOLT AND McINTOSH: HOLT'S DISEASES OF INFANCY AND CHILDHOOD, 1933)

One of the outstanding features of DEXTRI-MALTOSE is that it is almost unanimously preferred as the carbohydrate in the management of infantile diarrhea.



SERIOUSNESS OF DIARRHEA

There is a widespread opinion that, thanks to improved sanitation, infantile diarrhea is no longer of serious aspect. But Holt and McIntosh declare that diarrhea "is still a problem of the foremost importance, producing a number of deaths each year. . . ." Because dehydration is so often an insidious development even in mild cases, prompt and effective treatment is vital. Little states (Canad. Med. A. J. 13: 803, 1923), "There are cases on record where death has taken place within 24 hours of the time of onset of the first symptoms."

Just as DEXTRI-MALTOSE is a *carbohydrate* modifier of choice, so is CASEC (calcium caseinate) an accepted *protein* modifier. Casec is of special value for (1) colic and loose green stools in breast-fed infants, (2) fermentative diarrhea in bottle-fed infants, (3) prematures, (4) marasmus, (5) celiac disease.

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(meta-amino-para-hydroxy-phenylarsine oxide hydrochloride)

A REFINEMENT OF THE ARSENICAL THERAPY OF SYPHILIS

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Mapharsen has been accepted by the Council on Pharmacy and Chemistry of the American Medical Association.

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